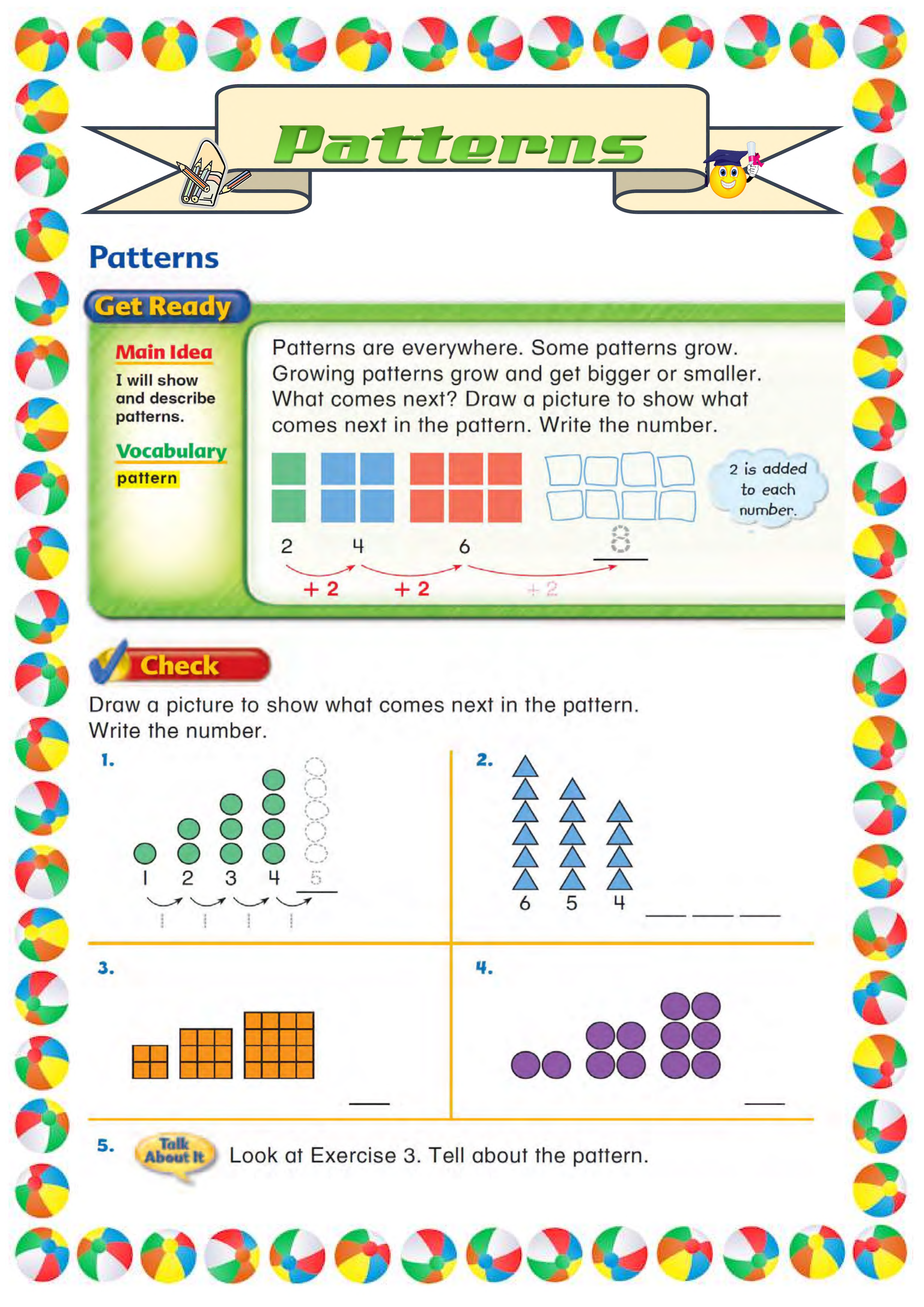

Chapter
One



Patterns

Patterns

Get Ready

Main Idea

I will show and describe patterns.

Vocabulary

pattern

Patterns are everywhere. Some patterns grow. Growing patterns grow and get bigger or smaller. What comes next? Draw a picture to show what comes next in the pattern. Write the number.

Check

Draw a picture to show what comes next in the pattern. Write the number.

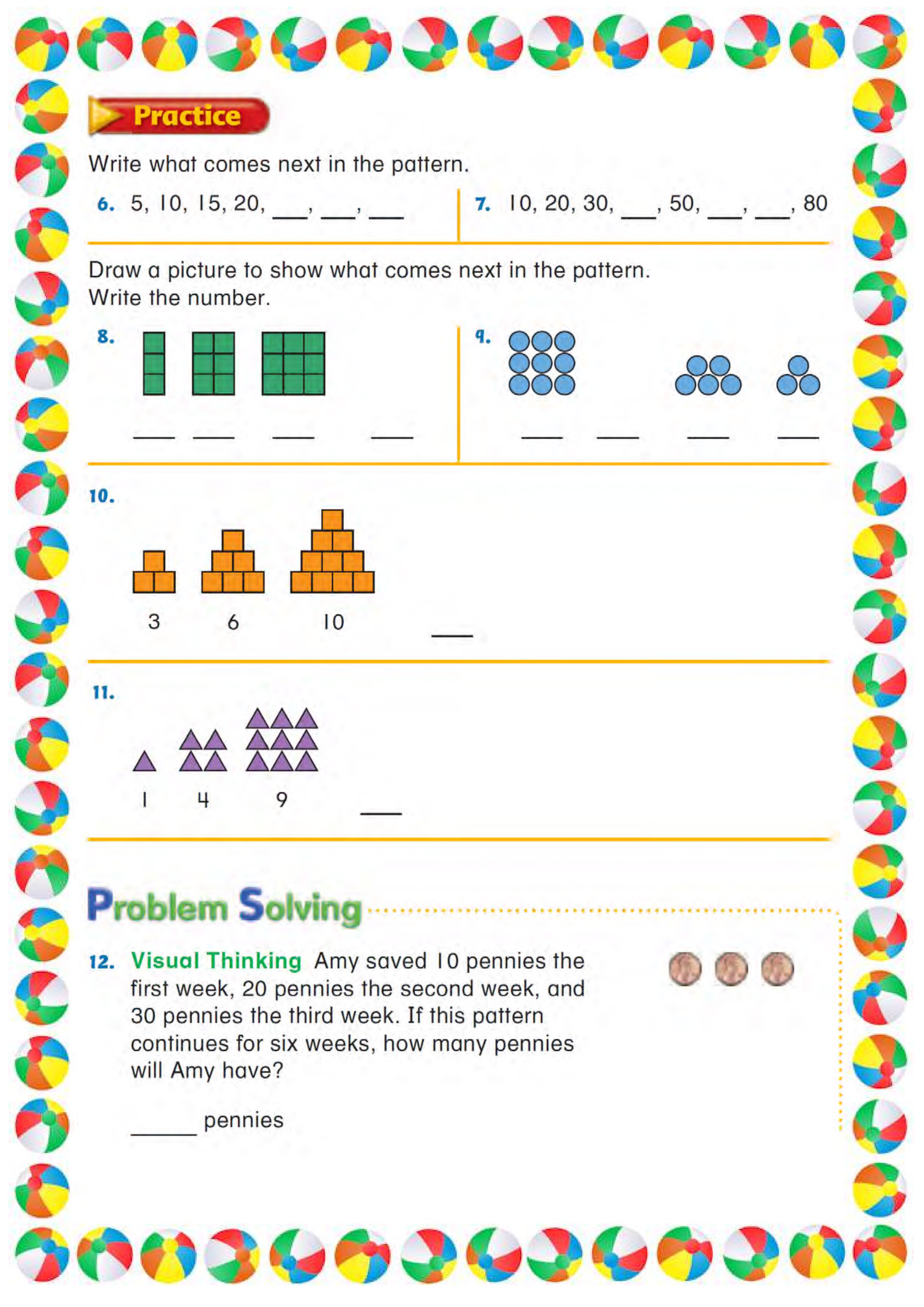
1.

2.

3.

4.

5. Talk About It Look at Exercise 3. Tell about the pattern.



Practice

Write what comes next in the pattern.

6. 5, 10, 15, 20, ___, ___, ___

7. 10, 20, 30, ___, 50, ___, ___, 80

Draw a picture to show what comes next in the pattern.
Write the number.

8. ___ ___ ___ ___

9. ___ ___ ___ ___

10.

3 6 10 ___

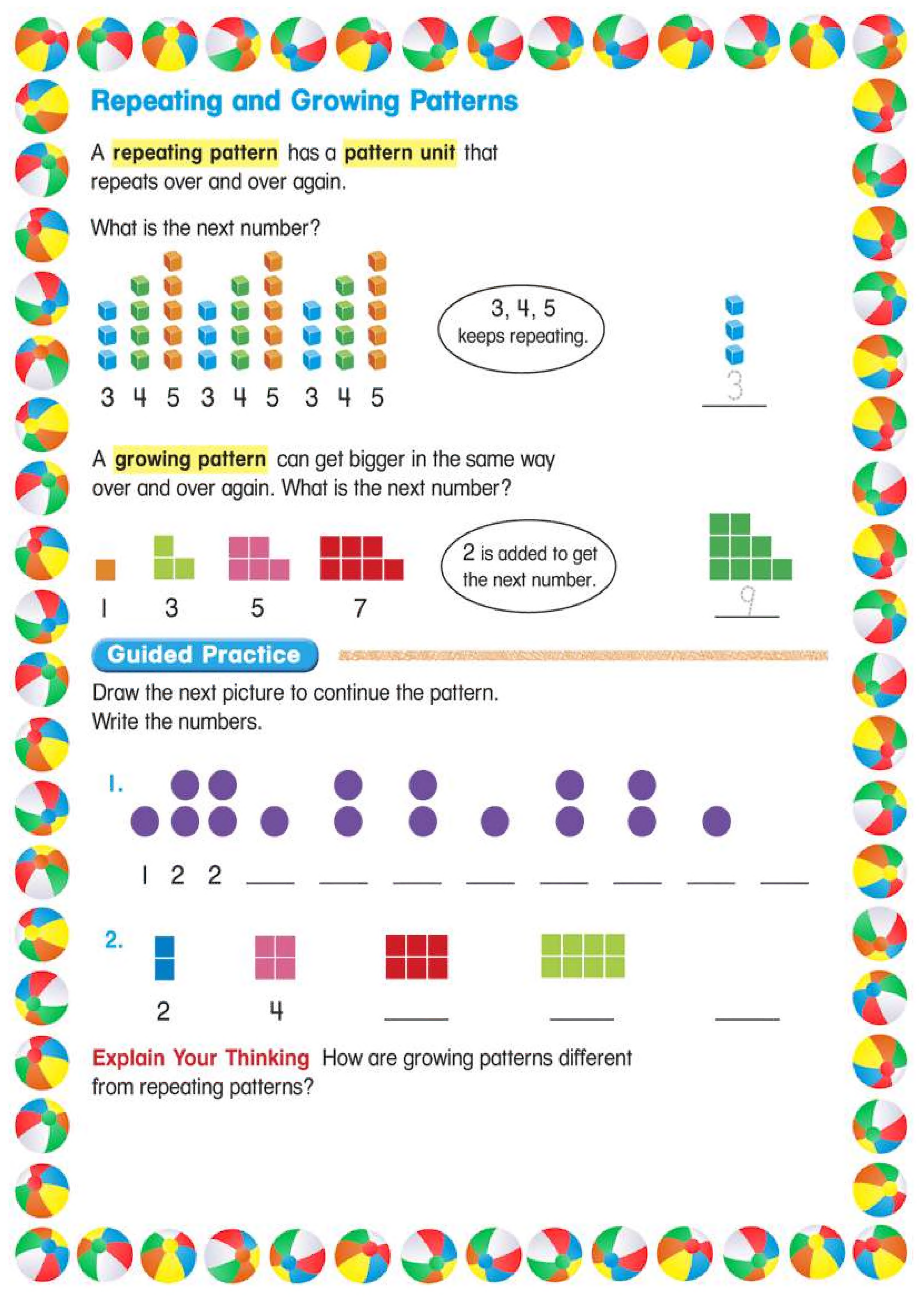
11.

1 4 9 ___

Problem Solving

12. **Visual Thinking** Amy saved 10 pennies the first week, 20 pennies the second week, and 30 pennies the third week. If this pattern continues for six weeks, how many pennies will Amy have?

______ pennies



Repeating and Growing Patterns

A **repeating pattern** has a **pattern unit** that repeats over and over again.

What is the next number?

3 4 5 3 4 5 3 4 5

3

A **growing pattern** can get bigger in the same way over and over again. What is the next number?

1 3 5 7

9

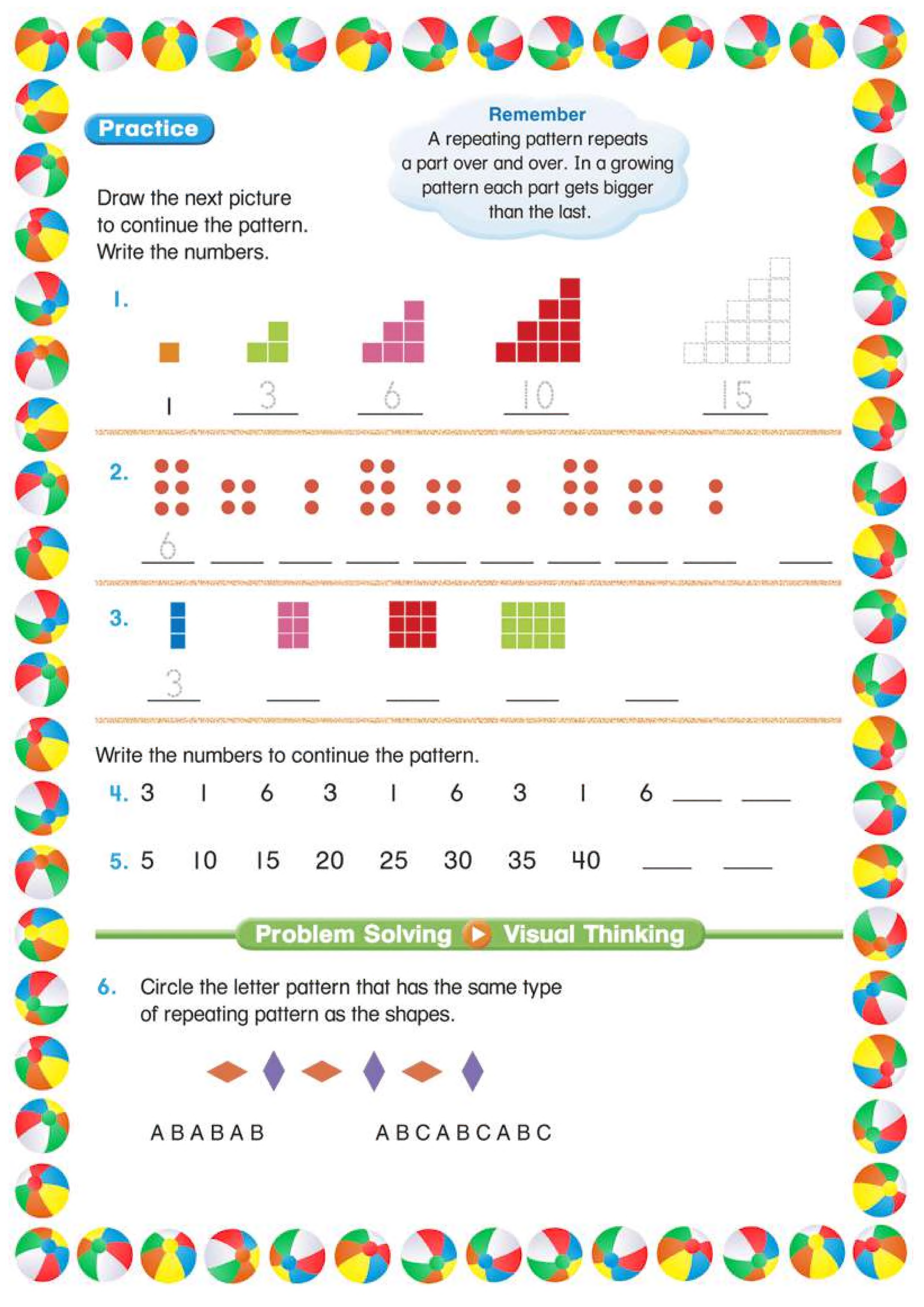
Guided Practice

Draw the next picture to continue the pattern. Write the numbers.

1. 1 2 2 ____ ____ ____ ____ ____ ____ ____ ____

2. 2 4 ____ ____ ____

Explain Your Thinking How are growing patterns different from repeating patterns?



Practice

Remember
A repeating pattern repeats a part over and over. In a growing pattern each part gets bigger than the last.

Draw the next picture to continue the pattern. Write the numbers.

1\. 1   3   6   10   15

2\. 6 ___ ___ ___ ___ ___ ___ ___ ___ ___

3\. 3 ___ ___ ___ ___

Write the numbers to continue the pattern.

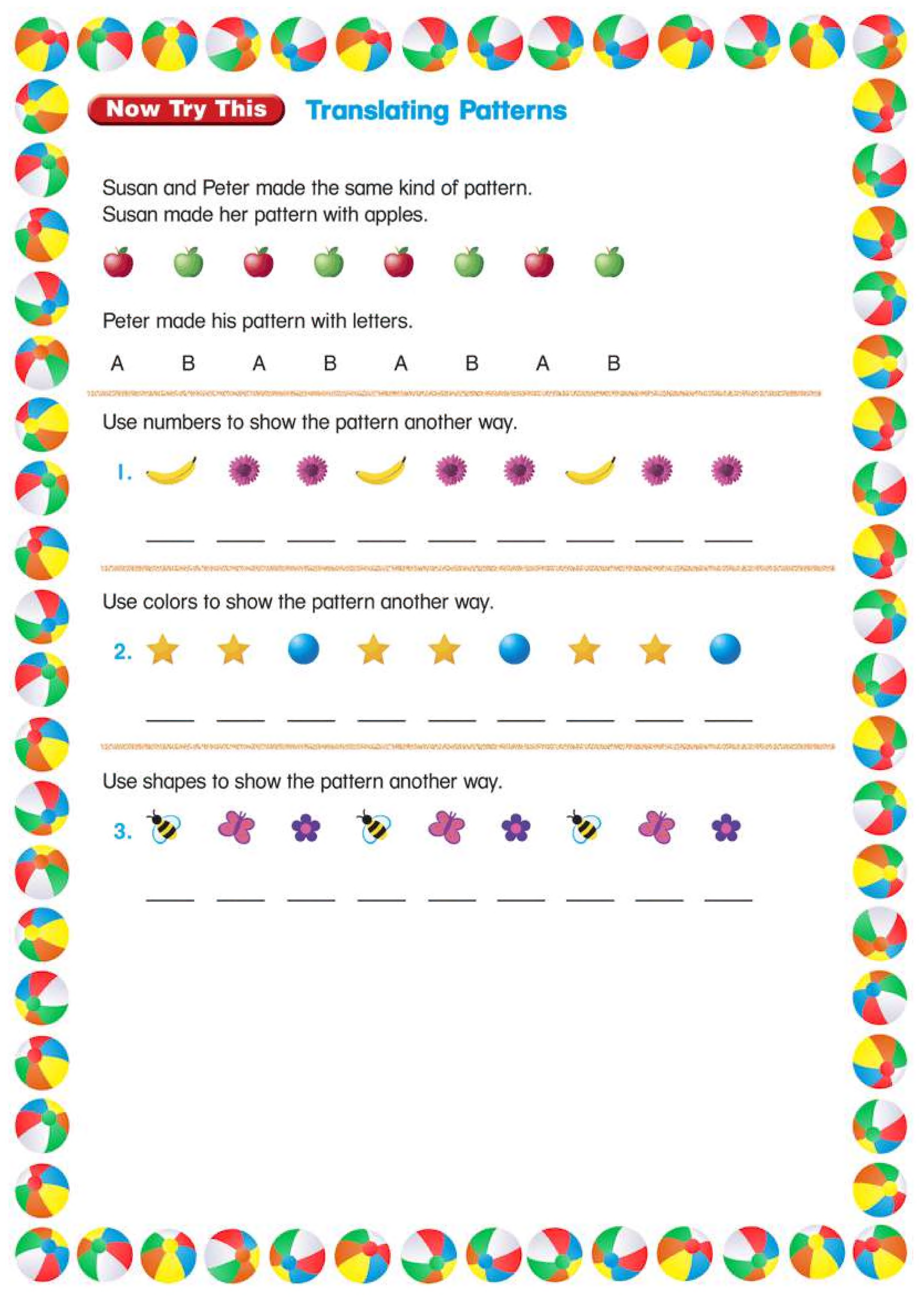
4\. 3 1 6 3 1 6 3 1 6 ___ ___

5\. 5 10 15 20 25 30 35 40 ___ ___

Problem Solving ▶ Visual Thinking

6\. Circle the letter pattern that has the same type of repeating pattern as the shapes.

A B A B A B   A B C A B C A B C



Now Try This Translating Patterns

Susan and Peter made the same kind of pattern.
Susan made her pattern with apples.

Peter made his pattern with letters.

A B A B A B A B

Use numbers to show the pattern another way.

1.

____ ____ ____ ____ ____ ____ ____ ____ ____

Use colors to show the pattern another way.

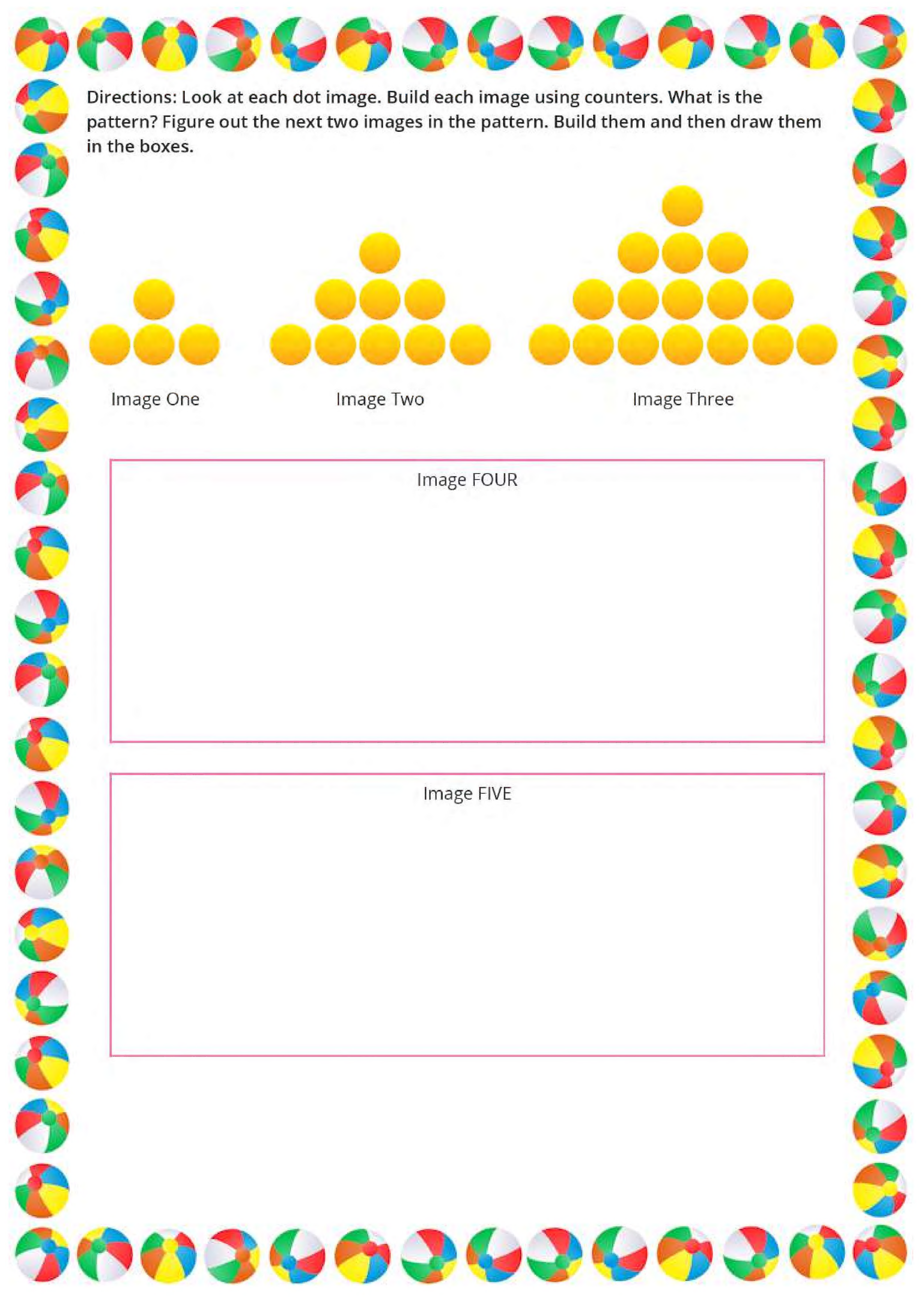
2.

____ ____ ____ ____ ____ ____ ____ ____ ____

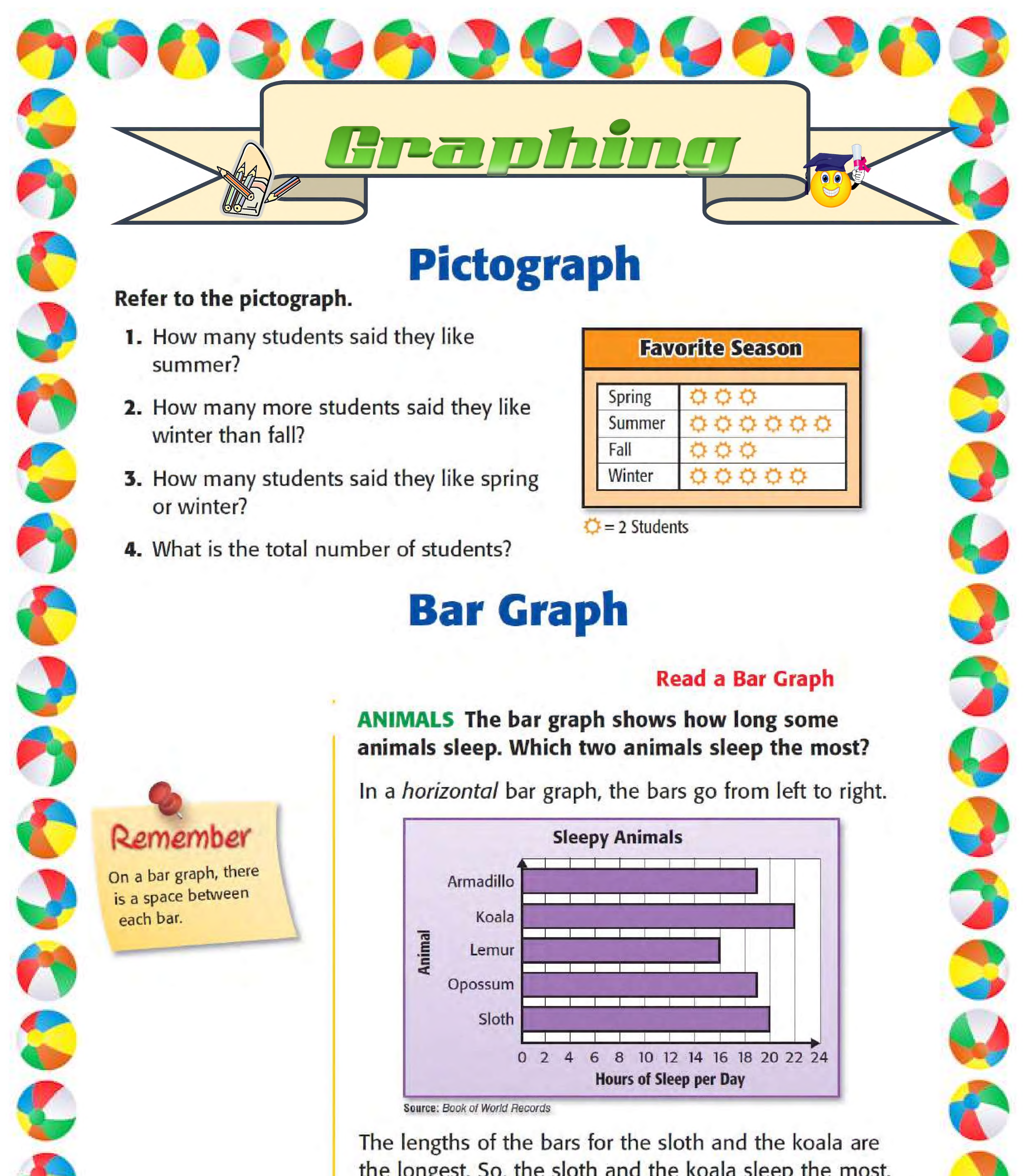
Use shapes to show the pattern another way.

3.

____ ____ ____ ____ ____ ____ ____ ____ ____



Directions: Look at each dot image. Build each image using counters. What is the pattern? Figure out the next two images in the pattern. Build them and then draw them in the boxes.



Graphing

Pictograph

Refer to the pictograph.

1. How many students said they like summer?
2. How many more students said they like winter than fall?
3. How many students said they like spring or winter?
4. What is the total number of students?

Favorite Season

Spring	☼ ☼ ☼
Summer	☼ ☼ ☼ ☼ ☼ ☼
Fall	☼ ☼ ☼
Winter	☼ ☼ ☼ ☼ ☼

☼ = 2 Students

Bar Graph

Read a Bar Graph

ANIMALS The bar graph shows how long some animals sleep. Which two animals sleep the most?

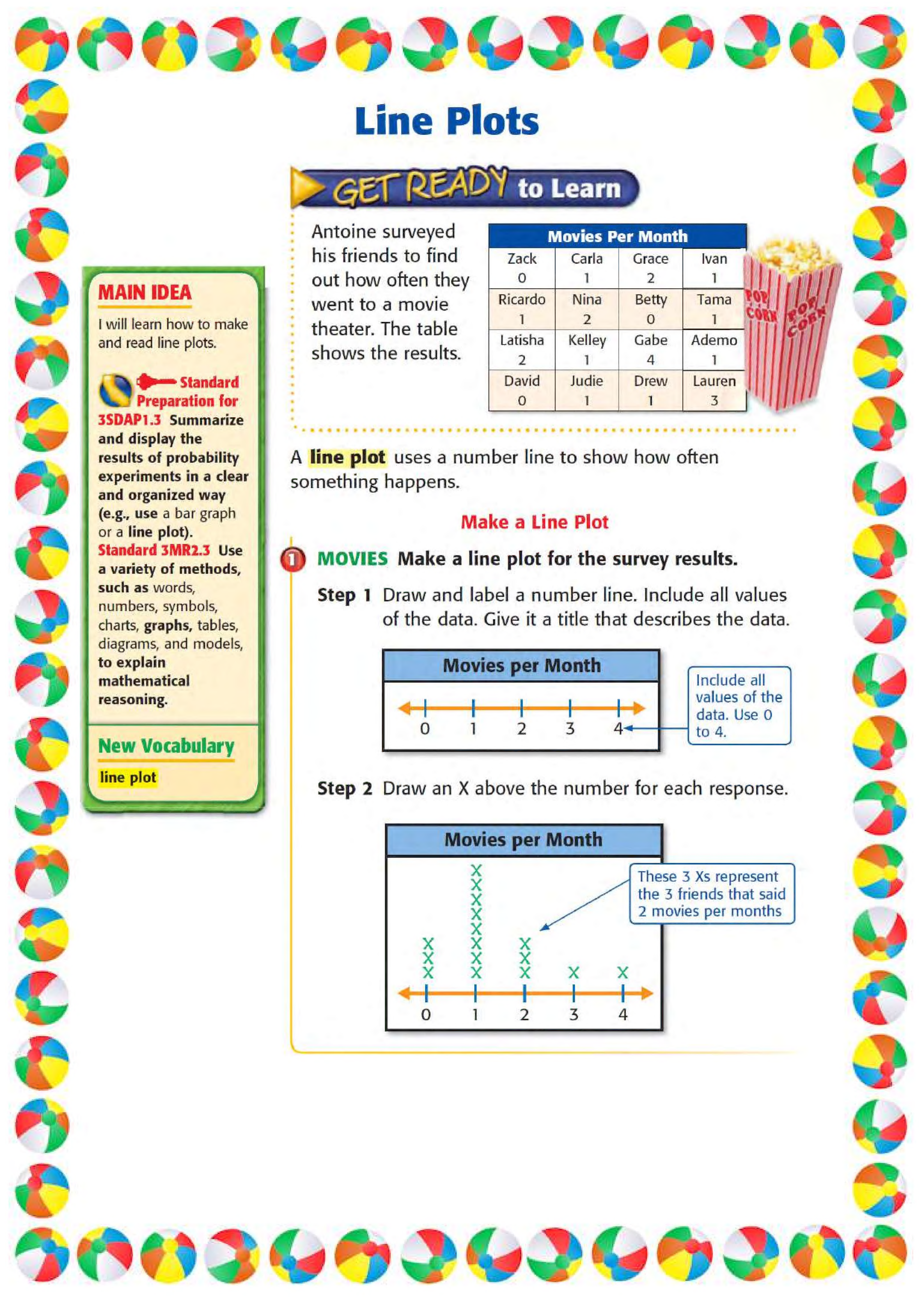
In a *horizontal* bar graph, the bars go from left to right.

Source: *Book of World Records*

The lengths of the bars for the sloth and the koala are the longest. So, the sloth and the koala sleep the most.

Remember

On a bar graph, there is a space between each bar.



Line Plots

GET READY to Learn

Antoine surveyed his friends to find out how often they went to a movie theater. The table shows the results.

Movies Per Month			
Zack 0	Carla 1	Grace 2	Ivan 1
Ricardo 1	Nina 2	Betty 0	Tama 1
Latisha 2	Kelley 1	Gabe 4	Ademo 1
David 0	Judie 1	Drew 1	Lauren 3

MAIN IDEA

I will learn how to make and read line plots.

Standard Preparation for 3SDAP1.3 **Summarize and display the results of probability experiments in a clear and organized way (e.g., use** a bar graph or a **line plot). Standard 3MR2.3** **Use a variety of methods, such as** words, numbers, symbols, charts, **graphs,** tables, diagrams, and models, **to explain mathematical reasoning.**

New Vocabulary

line plot

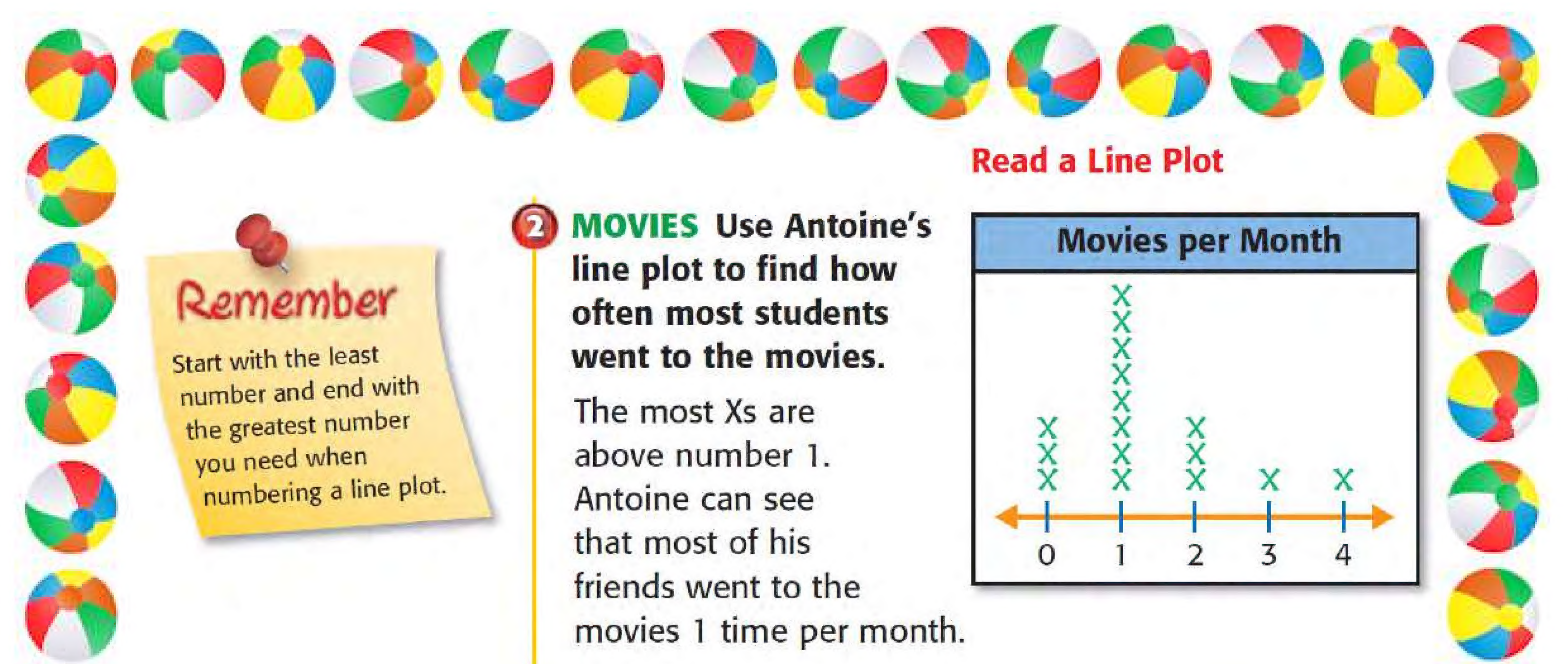
A **line plot** uses a number line to show how often something happens.

Make a Line Plot

1 **MOVIES** **Make a line plot for the survey results.**

Step 1 Draw and label a number line. Include all values of the data. Give it a title that describes the data.

Step 2 Draw an X above the number for each response.



Read a Line Plot

2 MOVIES Use Antoine's line plot to find how often most students went to the movies.

The most Xs are above number 1. Antoine can see that most of his friends went to the movies 1 time per month.

CHECK What You Know

Display each set of data in a line plot.

1.

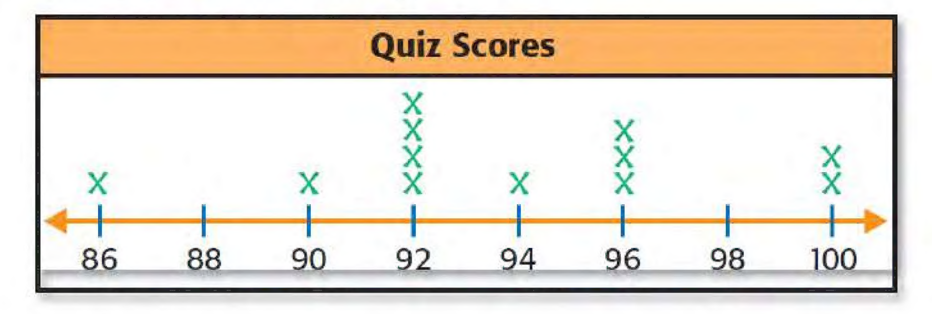
Third-Grade Shoe Size			
Jose 2	Ana 4	Julia 8	Martin 3
Lin 6	Tanya 5	Ronaldo 3	Cheye 4
William 4	Cole 5	Nat 4	Gabriel 5

2.

Weekly Time Spent on Homework

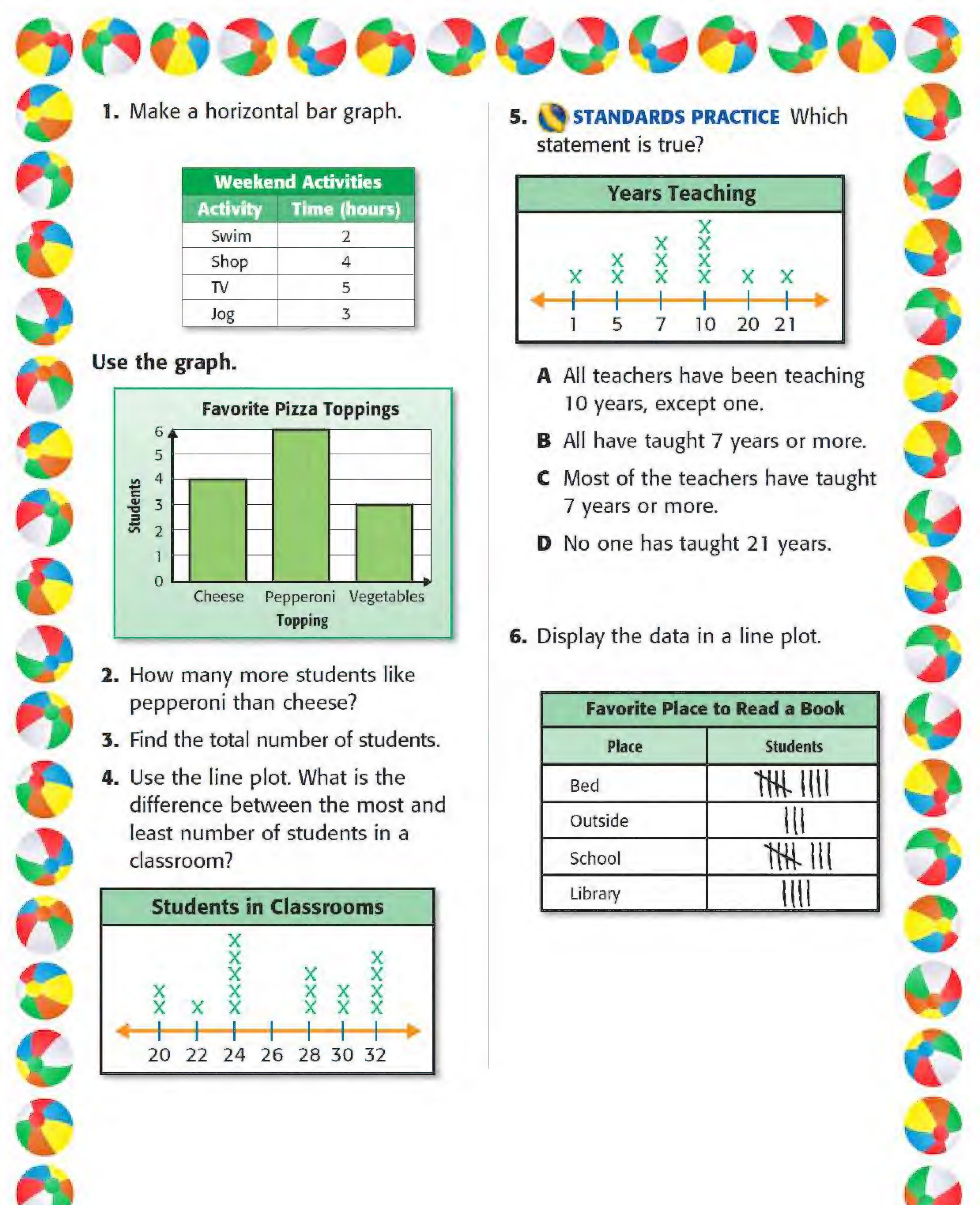
Time (hours)	Tally
8				
9	卌	
10	卌
11	卌 |||

For Exercises 3 and 4, use the line plot below.



3. How many student's quiz scores are recorded? Explain.

4. What is one conclusion you can draw from this line plot? Explain.



1. Make a horizontal bar graph.

Weekend Activities	
Activity	**Time (hours)**
Swim	2
Shop	4
TV	5
Jog	3

Use the graph.

2. How many more students like pepperoni than cheese?

3. Find the total number of students.

4. Use the line plot. What is the difference between the most and least number of students in a classroom?

5. **STANDARDS PRACTICE** Which statement is true?

A All teachers have been teaching 10 years, except one.

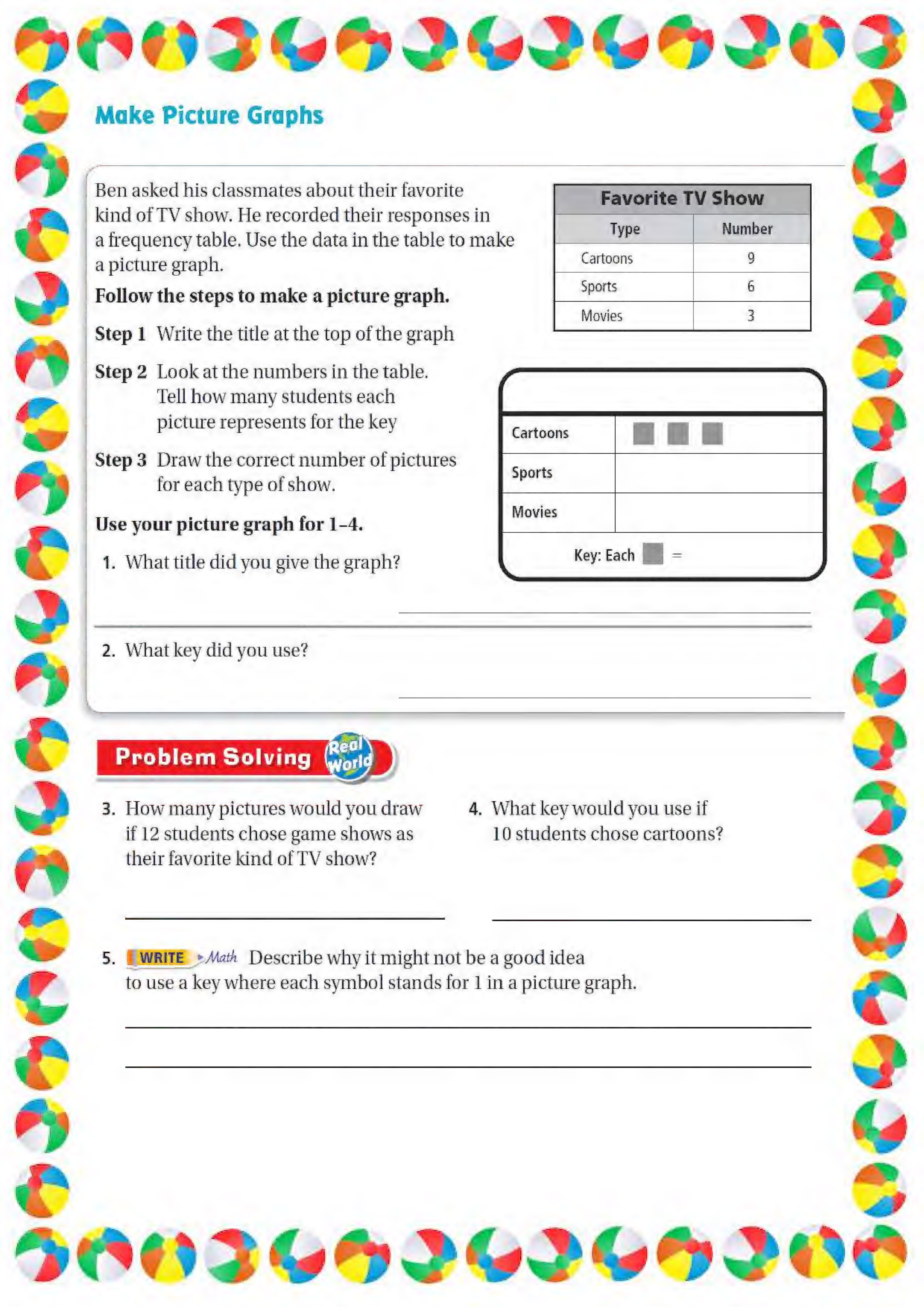
B All have taught 7 years or more.

C Most of the teachers have taught 7 years or more.

D No one has taught 21 years.

6. Display the data in a line plot.

Favorite Place to Read a Book	
Place	**Students**
Bed	𝍸 ||||
Outside	|||
School	𝍸 |||
Library	||||



Make Picture Graphs

Ben asked his classmates about their favorite kind of TV show. He recorded their responses in a frequency table. Use the data in the table to make a picture graph.

Favorite TV Show

Type	Number
Cartoons	9
Sports	6
Movies	3

Follow the steps to make a picture graph.

Step 1 Write the title at the top of the graph

Step 2 Look at the numbers in the table. Tell how many students each picture represents for the key

Step 3 Draw the correct number of pictures for each type of show.

Cartoons	■ ■ ■
Sports	
Movies	

Key: Each ■ =

Use your picture graph for 1–4.

1. What title did you give the graph?

2. What key did you use?

Problem Solving Real World

3. How many pictures would you draw if 12 students chose game shows as their favorite kind of TV show?

4. What key would you use if 10 students chose cartoons?

5. WRITE Math Describe why it might not be a good idea to use a key where each symbol stands for 1 in a picture graph.

Share and Show MATH BOARD

Hands On

Matt's school is having a walk-a-thon to raise money for the school library. Matt made a picture graph to show the number of miles some students walked. Make a bar graph of Matt's data. Use a scale of 0–_____, and mark the scale by _____.

School Walk-a-Thon

Sam	👕 👕 👕 👕 👕
Matt	👕 👕 half 👕
Ben	👕
Erica	👕 👕 👕 👕
Key: Each 👕 = 2 miles.	

Use your bar graph for 1–4.

1. Which student walked the most miles? ______
   Think: Which student's bar is the tallest?

2. How many more miles would Matt have had to walk to equal the number of miles Erica walked? ______

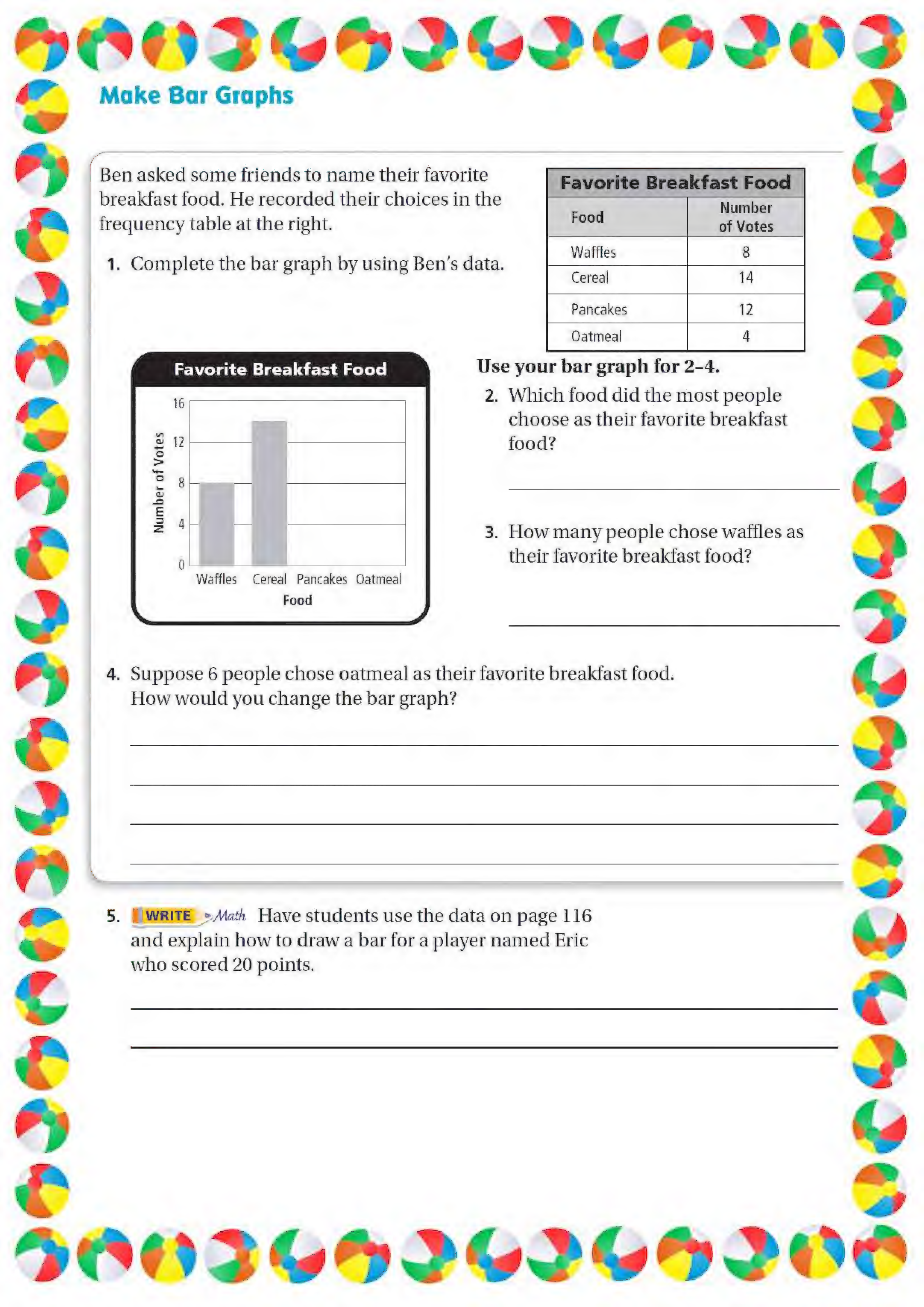
3. How many miles did the students walk? ______

4. Write the number of miles the students walked in order from greatest to least. ______

Math Talk

MATHEMATICAL PRACTICES 3

Apply How would the graph have to change if another student, Daniel, walked double the number of miles Erica walked?



Make Bar Graphs

Ben asked some friends to name their favorite breakfast food. He recorded their choices in the frequency table at the right.

Favorite Breakfast Food	
Food	Number of Votes
Waffles	8
Cereal	14
Pancakes	12
Oatmeal	4

1. Complete the bar graph by using Ben's data.

Use your bar graph for 2–4.

2. Which food did the most people choose as their favorite breakfast food?

____

3. How many people chose waffles as their favorite breakfast food?

____

4. Suppose 6 people chose oatmeal as their favorite breakfast food. How would you change the bar graph?

____

____

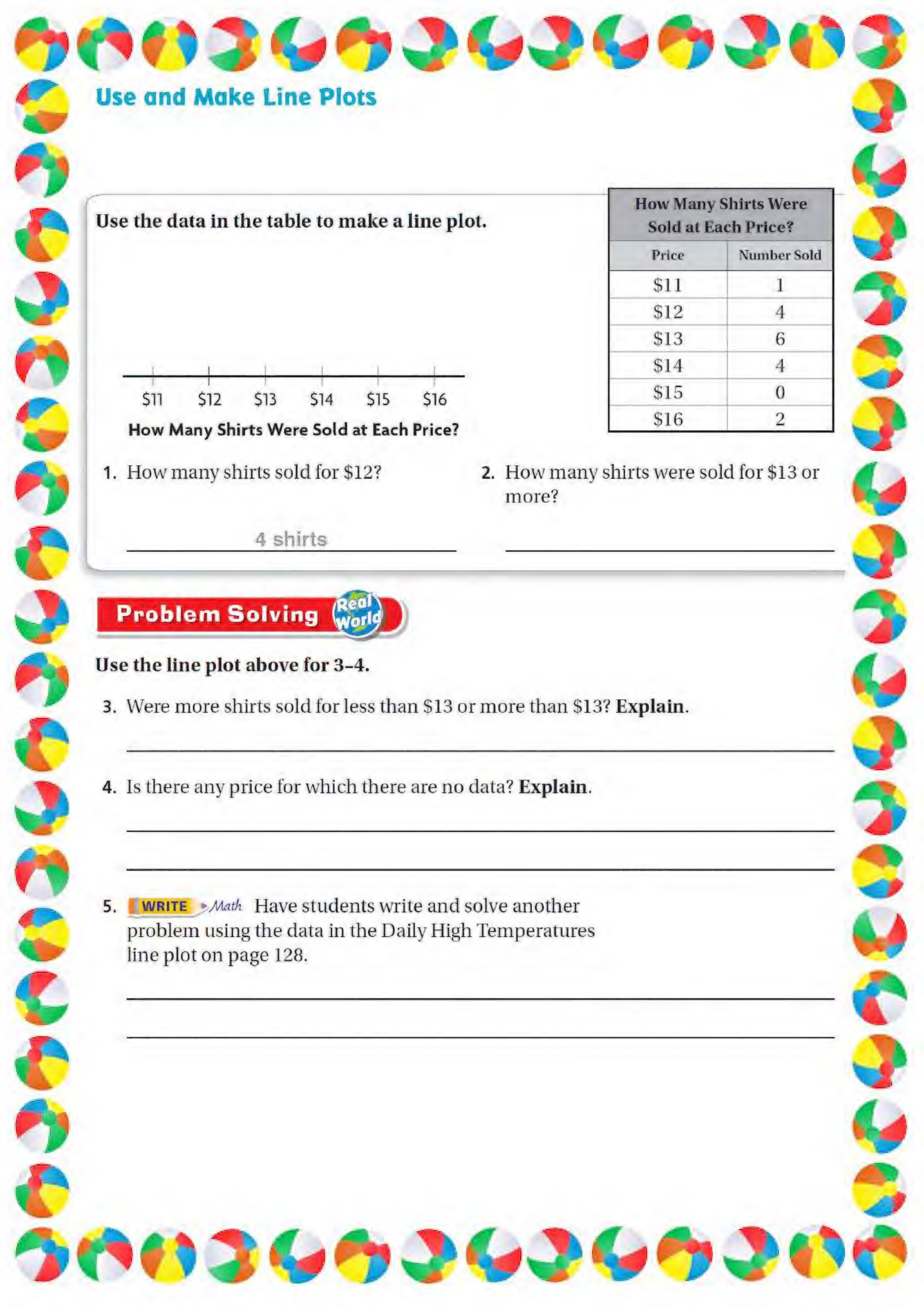
____

____

5. **WRITE** *Math* Have students use the data on page 116 and explain how to draw a bar for a player named Eric who scored 20 points.

____

____



Use and Make Line Plots

Use the data in the table to make a line plot.

How Many Shirts Were Sold at Each Price?	
Price	Number Sold
$11	1
$12	4
$13	6
$14	4
$15	0
$16	2

1. How many shirts sold for $12?

   4 shirts

2. How many shirts were sold for $13 or more?

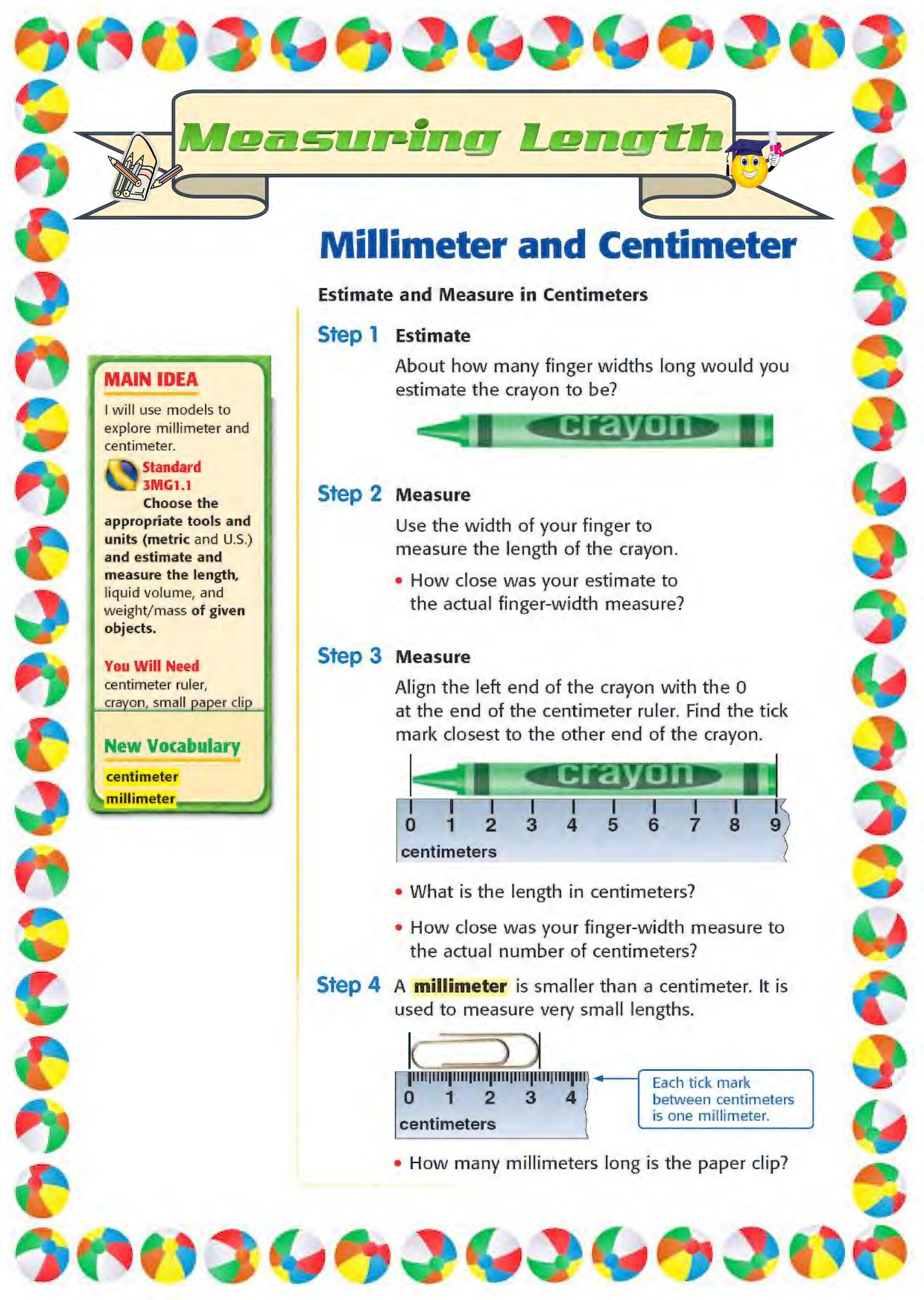
Problem Solving Real World

Use the line plot above for 3–4.

3. Were more shirts sold for less than $13 or more than $13? **Explain.**

4. Is there any price for which there are no data? **Explain.**

5. WRITE Math Have students write and solve another problem using the data in the Daily High Temperatures line plot on page 128.



Measuring Length

Millimeter and Centimeter

MAIN IDEA

I will use models to explore millimeter and centimeter.

Standard 3MG1.1 **Choose the appropriate tools and units (metric** and U.S.) **and estimate and measure the length,** liquid volume, and weight/mass **of given objects.**

You Will Need

centimeter ruler, crayon, small paper clip

New Vocabulary

centimeter
millimeter

Estimate and Measure in Centimeters

Step 1 **Estimate**

About how many finger widths long would you estimate the crayon to be?

Step 2 **Measure**

Use the width of your finger to measure the length of the crayon.

- How close was your estimate to the actual finger-width measure?

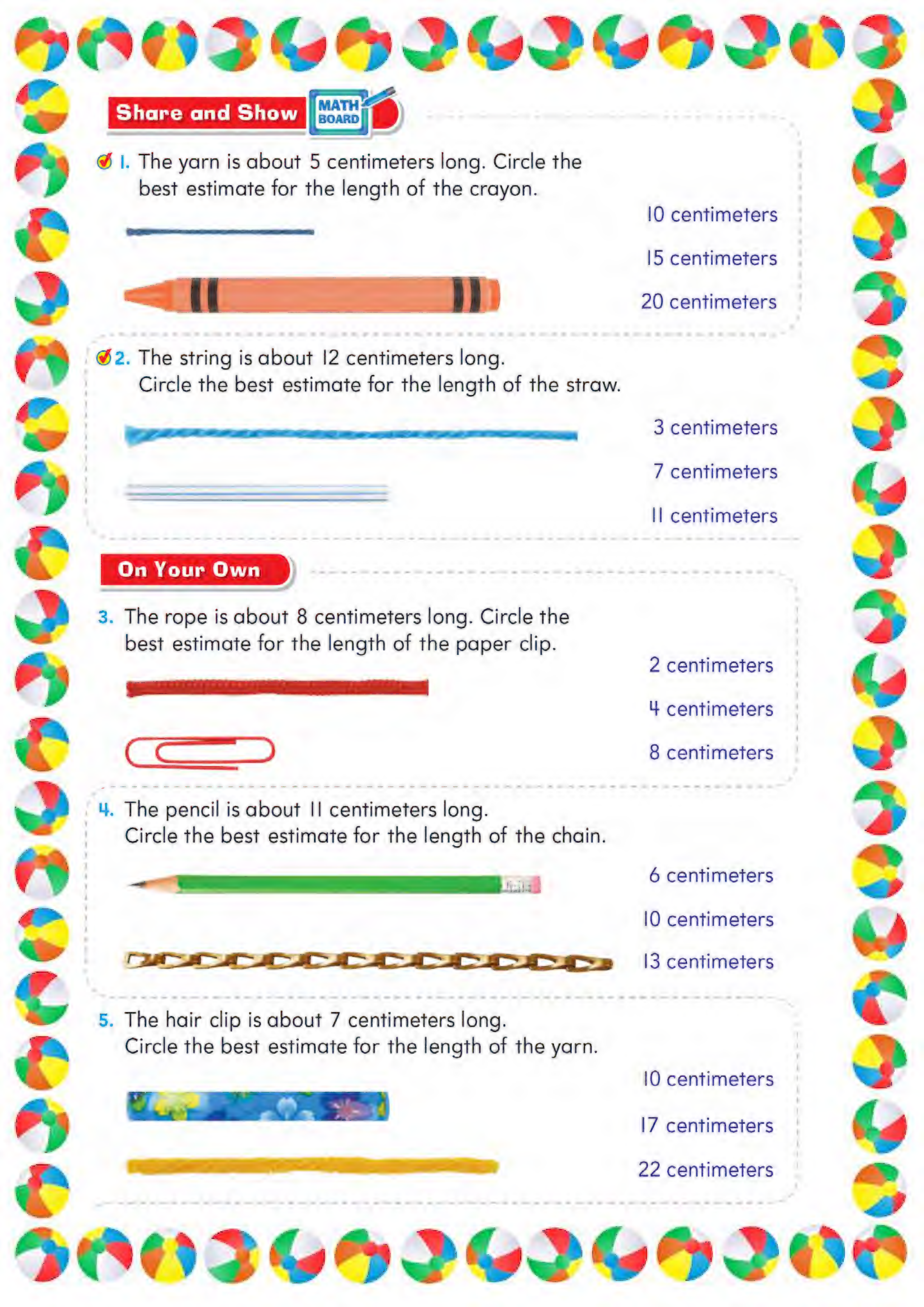
Step 3 **Measure**

Align the left end of the crayon with the 0 at the end of the centimeter ruler. Find the tick mark closest to the other end of the crayon.

- What is the length in centimeters?
- How close was your finger-width measure to the actual number of centimeters?

Step 4 A **millimeter** is smaller than a centimeter. It is used to measure very small lengths.

- How many millimeters long is the paper clip?



Share and Show

MATH BOARD

1. The yarn is about 5 centimeters long. Circle the best estimate for the length of the crayon.

10 centimeters

15 centimeters

20 centimeters

2. The string is about 12 centimeters long. Circle the best estimate for the length of the straw.

3 centimeters

7 centimeters

11 centimeters

On Your Own

3. The rope is about 8 centimeters long. Circle the best estimate for the length of the paper clip.

2 centimeters

4 centimeters

8 centimeters

4. The pencil is about 11 centimeters long. Circle the best estimate for the length of the chain.

6 centimeters

10 centimeters

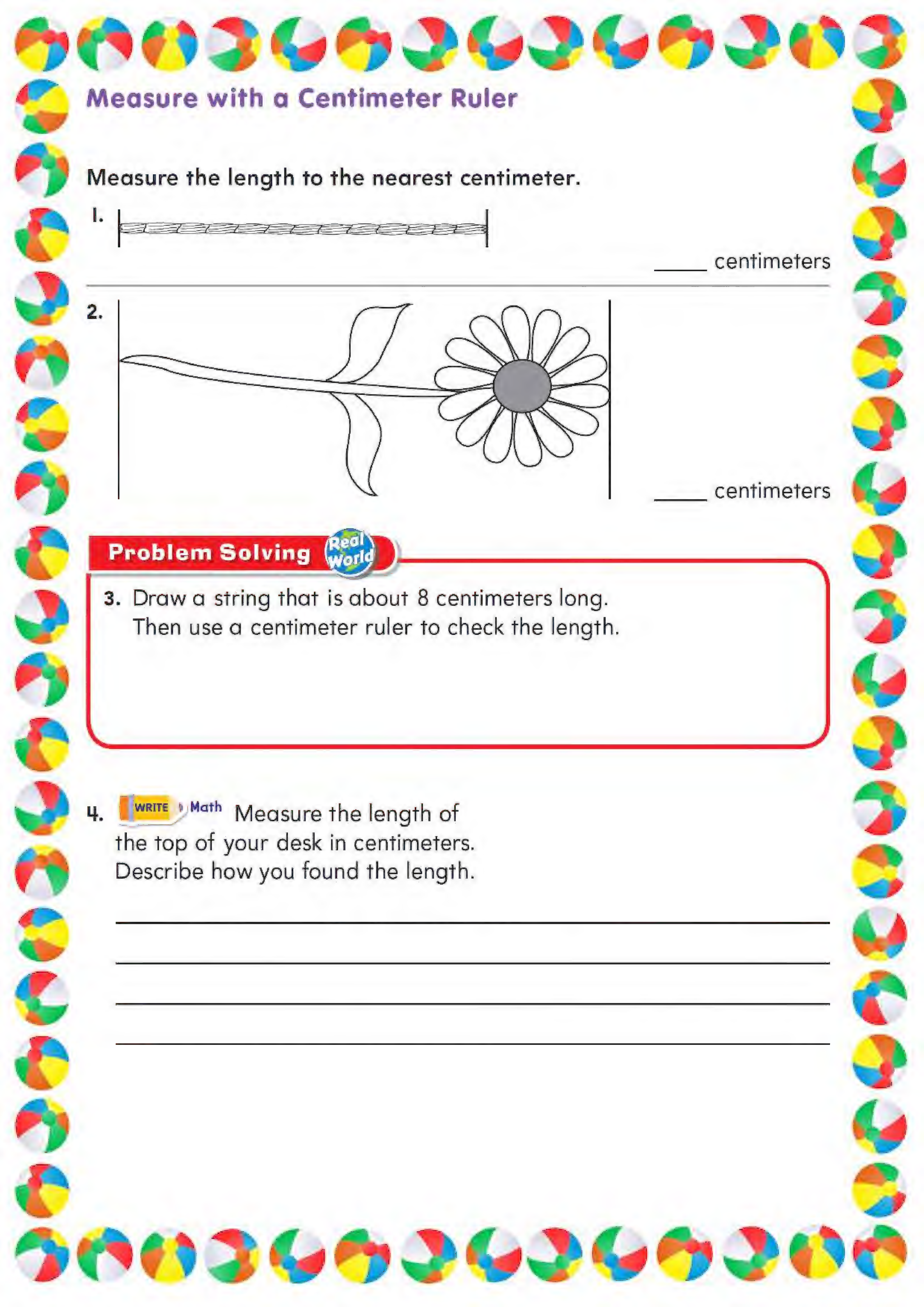
13 centimeters

5. The hair clip is about 7 centimeters long. Circle the best estimate for the length of the yarn.

10 centimeters

17 centimeters

22 centimeters



Measure with a Centimeter Ruler

Measure the length to the nearest centimeter.

1\. _____ centimeters

2\. _____ centimeters

Problem Solving Real World

3\. Draw a string that is about 8 centimeters long.
Then use a centimeter ruler to check the length.

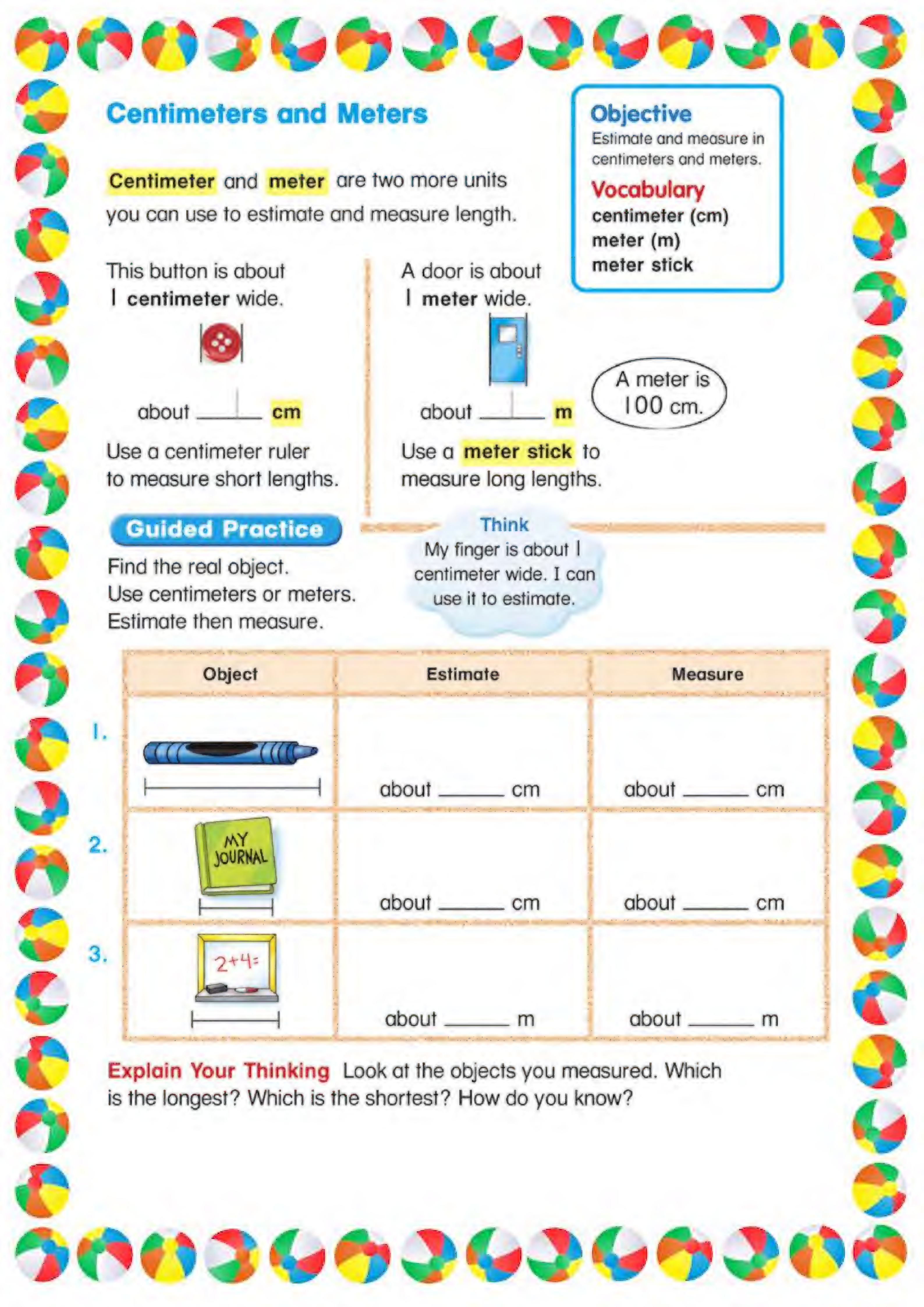
4\. WRITE Math Measure the length of the top of your desk in centimeters. Describe how you found the length.

____

____

____

____



Centimeters and Meters

Objective
Estimate and measure in centimeters and meters.

Vocabulary
centimeter (cm)
meter (m)
meter stick

Centimeter and **meter** are two more units you can use to estimate and measure length.

This button is about 1 **centimeter** wide.

about ___ **cm**

Use a centimeter ruler to measure short lengths.

A door is about 1 **meter** wide.

about ___ **m**

A meter is 100 cm.

Use a **meter stick** to measure long lengths.

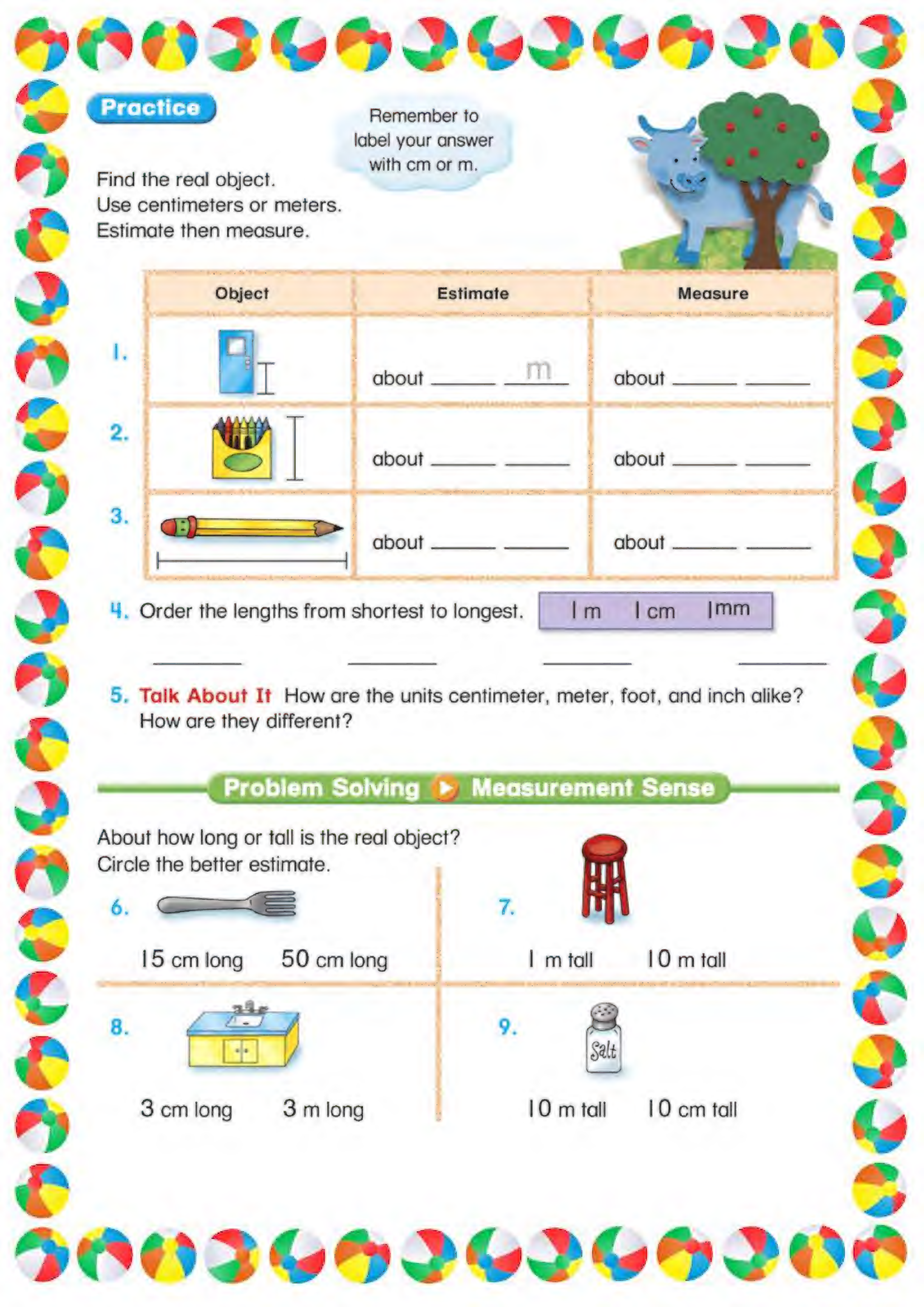
Guided Practice

Find the real object.
Use centimeters or meters.
Estimate then measure.

Think
My finger is about 1 centimeter wide. I can use it to estimate.

	Object	Estimate	Measure
1.		about ___ cm	about ___ cm
2.	MY JOURNAL	about ___ cm	about ___ cm
3.	2+4=	about ___ m	about ___ m

Explain Your Thinking Look at the objects you measured. Which is the longest? Which is the shortest? How do you know?



Practice

Remember to label your answer with cm or m.

Find the real object.
Use centimeters or meters.
Estimate then measure.

	Object	Estimate	Measure
1.		about ______ m	about ______ ______
2.		about ______ ______	about ______ ______
3.		about ______ ______	about ______ ______

4. Order the lengths from shortest to longest. 1 m 1 cm 1mm

______ ______ ______ ______

5. **Talk About It** How are the units centimeter, meter, foot, and inch alike? How are they different?

Problem Solving ▶ Measurement Sense

About how long or tall is the real object?
Circle the better estimate.

6. 15 cm long 50 cm long

7. 1 m tall 10 m tall

8. 3 cm long 3 m long

9. 10 m tall 10 cm tall



Model and Draw

1 **meter** is the same as 100 centimeters.

The real door is about 200 centimeters tall.
The real door is also about 2 meters tall.

Share and Show

MATH BOARD

Measure to the nearest centimeter.
Then measure to the nearest meter.

	Find the real object.	Measure.
1.	chair	______ centimeters ______ meters
2.	teacher's desk	______ centimeters ______ meters
3.	wall	______ centimeters ______ meters



Look at the images below. Decide if the objects they depict should be measured in centimeters or meters and then write the word in the table.

IMAGES	METERS OR CENTIMETERS?


Chapter
Two



Thousands

Objective Identify values of digits in numbers to 9,999.



Learn About It

When the Space Shuttle returns to Earth, it gets very hot. That is why the shuttle is made of materials that can stand temperatures of more than 2,390°F!

▶ **A place-value chart can help explain what this number means.**

thousands	hundreds	tens	ones
2	3	9	0
↑ The value of the 2 is 2,000.	↑ The value of the 3 is 300.	↑ The value of the 9 is 90.	↑ The value of the 0 is 0.

▶ **There are different ways to write 2,390.**

Different Ways to Write a Number	
You can use **standard form.**	2,390
You can use **expanded form.**	2,000 + 300 + 90
You can use **word form.**	two thousand, three hundred ninety

Guided Practice

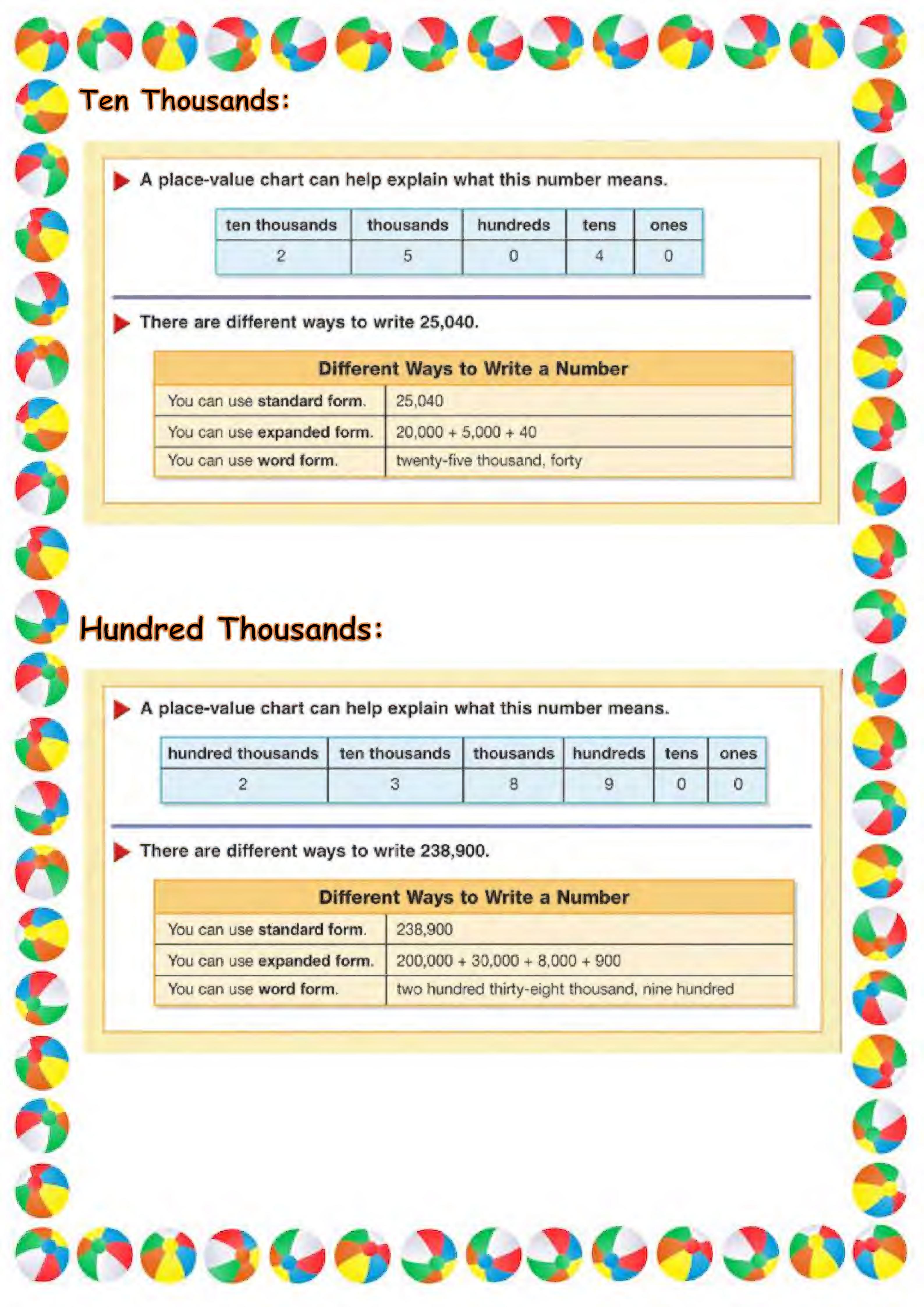
Write each number in two other ways. Use standard form, expanded form, and word form.

1. 1,000 + 700 + 8
2. seven thousand, thirty-six
3. 2,039
4. four thousand, one hundred five

Ask Yourself

- What is the value of each digit in the number?
- Do any places have zeros?

Explain Your Thinking ▶ In what ways are 2,390 and 3,290 similar? In what ways are they different?



Ten Thousands:

▶ A place-value chart can help explain what this number means.

ten thousands	thousands	hundreds	tens	ones
2	5	0	4	0

▶ There are different ways to write 25,040.

Different Ways to Write a Number	
You can use **standard form**.	25,040
You can use **expanded form**.	20,000 + 5,000 + 40
You can use **word form**.	twenty-five thousand, forty

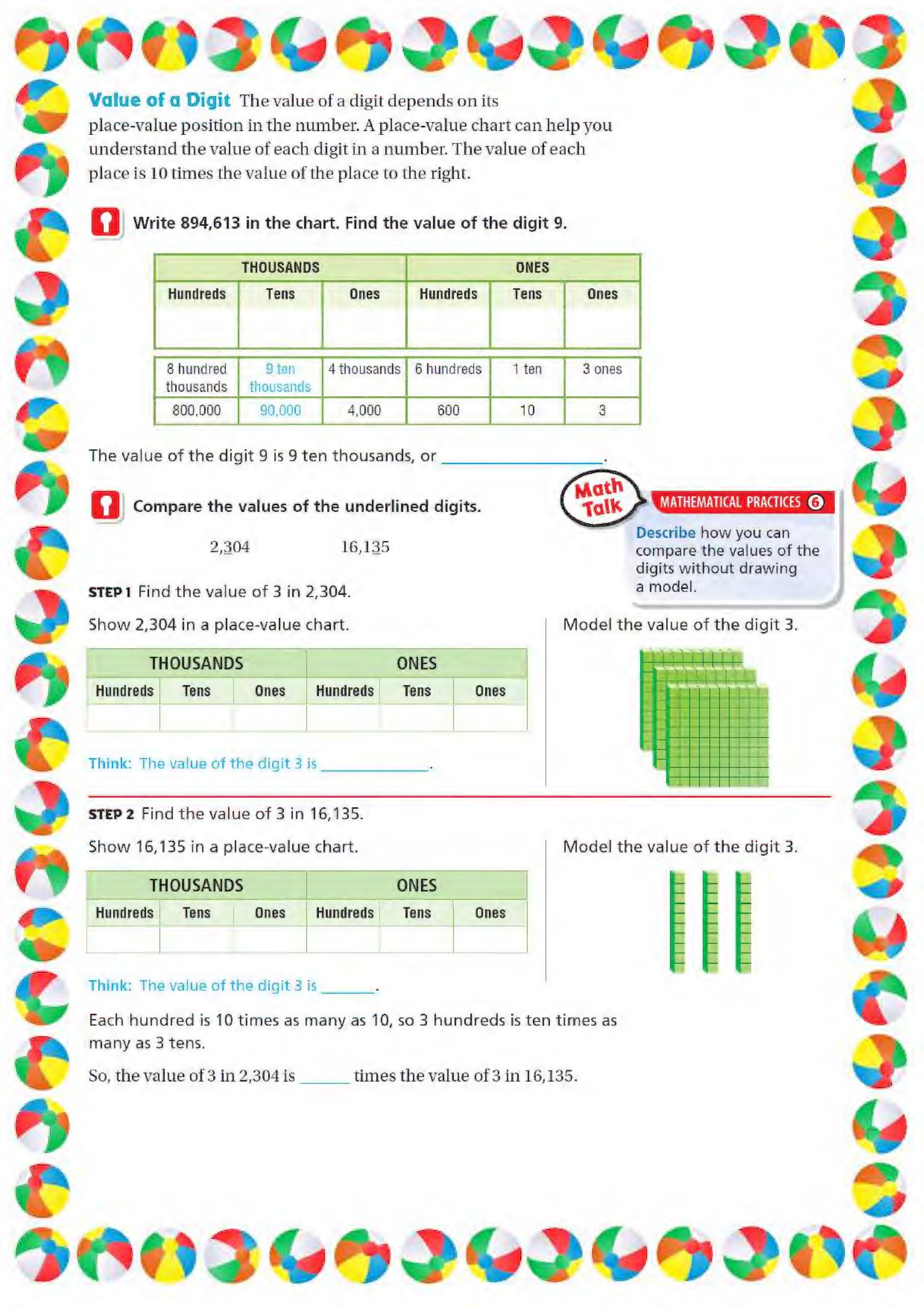
Hundred Thousands:

▶ A place-value chart can help explain what this number means.

hundred thousands	ten thousands	thousands	hundreds	tens	ones
2	3	8	9	0	0

▶ There are different ways to write 238,900.

Different Ways to Write a Number	
You can use **standard form**.	238,900
You can use **expanded form**.	200,000 + 30,000 + 8,000 + 900
You can use **word form**.	two hundred thirty-eight thousand, nine hundred



Value of a Digit The value of a digit depends on its place-value position in the number. A place-value chart can help you understand the value of each digit in a number. The value of each place is 10 times the value of the place to the right.

Write 894,613 in the chart. Find the value of the digit 9.

THOUSANDS			ONES		
Hundreds	Tens	Ones	Hundreds	Tens	Ones
8 hundred thousands	9 ten thousands	4 thousands	6 hundreds	1 ten	3 ones
800,000	90,000	4,000	600	10	3

The value of the digit 9 is 9 ten thousands, or ______________.

Compare the values of the underlined digits.

2,3̲04   16,13̲5

Math Talk MATHEMATICAL PRACTICES 6

Describe how you can compare the values of the digits without drawing a model.

STEP 1 Find the value of 3 in 2,304.

Show 2,304 in a place-value chart.

THOUSANDS			ONES		
Hundreds	Tens	Ones	Hundreds	Tens	Ones

Think: The value of the digit 3 is ______________.

Model the value of the digit 3.

STEP 2 Find the value of 3 in 16,135.

Show 16,135 in a place-value chart.

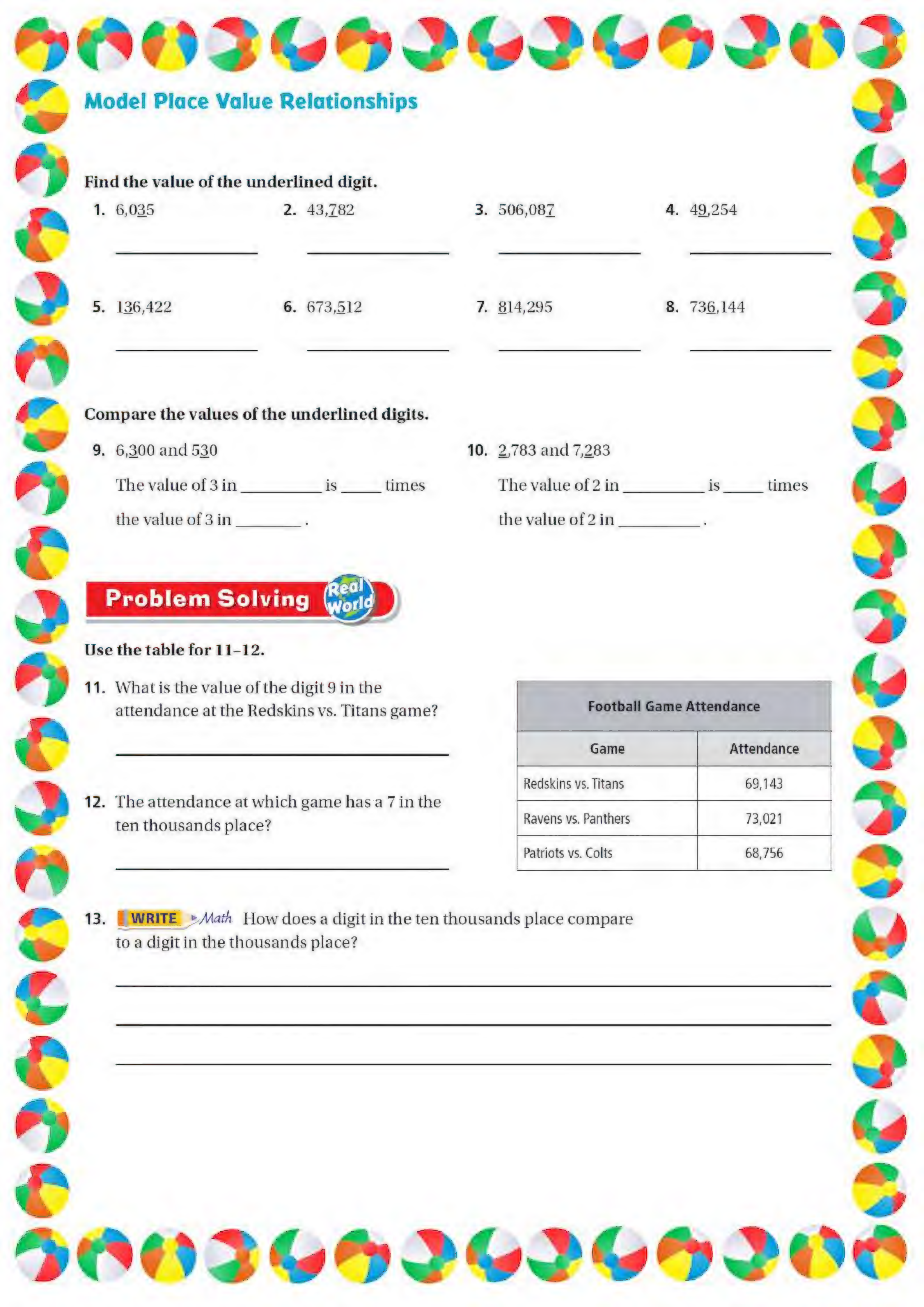
THOUSANDS			ONES		
Hundreds	Tens	Ones	Hundreds	Tens	Ones

Think: The value of the digit 3 is _______.

Model the value of the digit 3.

Each hundred is 10 times as many as 10, so 3 hundreds is ten times as many as 3 tens.

So, the value of 3 in 2,304 is ______ times the value of 3 in 16,135.



Model Place Value Relationships

Find the value of the underlined digit.

1. 6,035 ____________
2. 43,782 ____________
3. 506,087 ____________
4. 49,254 ____________
5. 136,422 ____________
6. 673,512 ____________
7. 814,295 ____________
8. 736,144 ____________

Compare the values of the underlined digits.

9. 6,300 and 530

   The value of 3 in ________ is _____ times the value of 3 in ________ .

10. 2,783 and 7,283

   The value of 2 in ________ is _____ times the value of 2 in ________ .

Problem Solving Real World

Use the table for 11–12.

11. What is the value of the digit 9 in the attendance at the Redskins vs. Titans game?

    ____

12. The attendance at which game has a 7 in the ten thousands place?

    ____

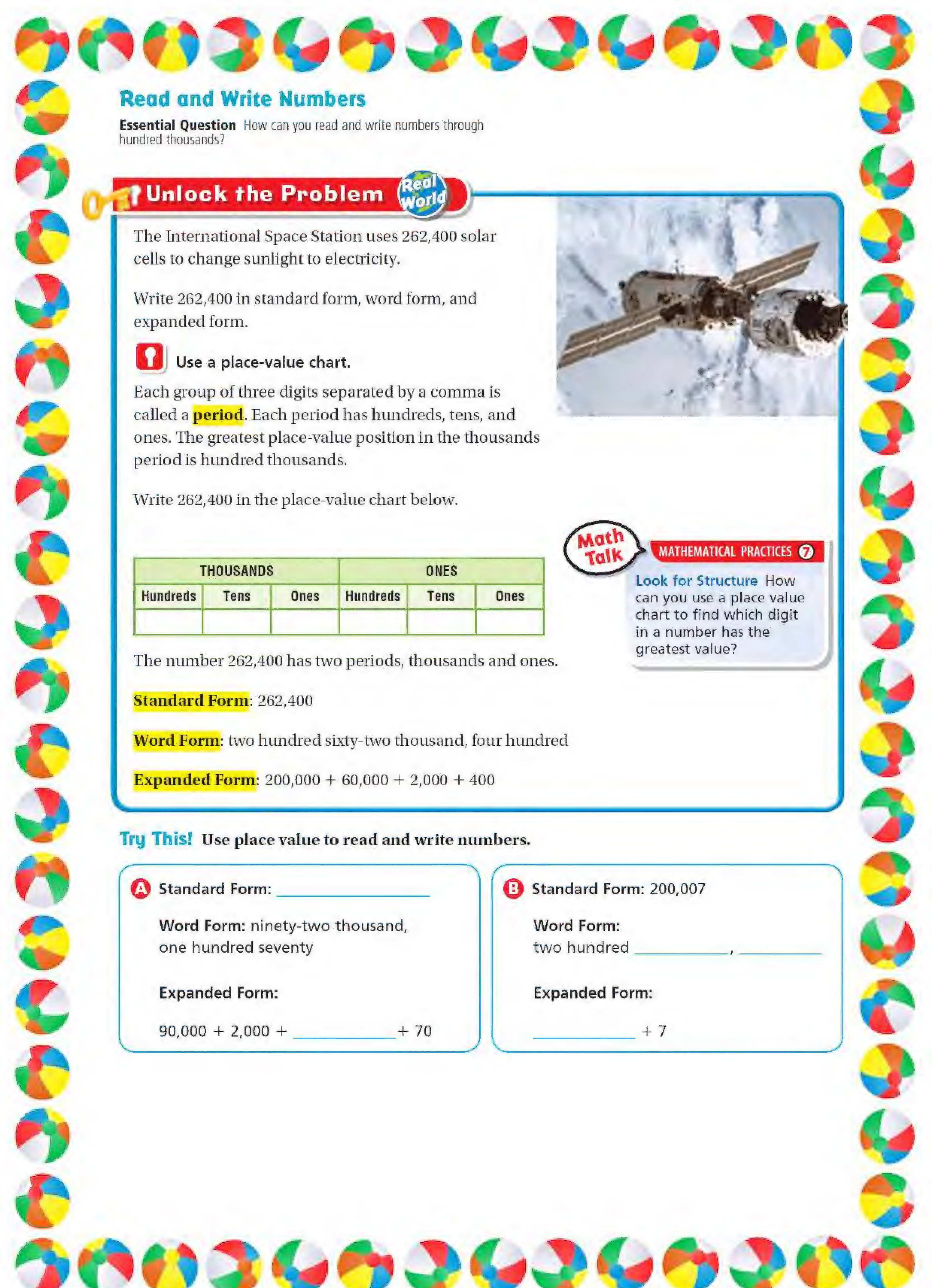
Football Game Attendance	
Game	**Attendance**
Redskins vs. Titans	69,143
Ravens vs. Panthers	73,021
Patriots vs. Colts	68,756

13. WRITE Math How does a digit in the ten thousands place compare to a digit in the thousands place?

    ____

    ____

    ____



Read and Write Numbers

Essential Question How can you read and write numbers through hundred thousands?

Unlock the Problem — Real World

The International Space Station uses 262,400 solar cells to change sunlight to electricity.

Write 262,400 in standard form, word form, and expanded form.

Use a place-value chart.

Each group of three digits separated by a comma is called a **period**. Each period has hundreds, tens, and ones. The greatest place-value position in the thousands period is hundred thousands.

Write 262,400 in the place-value chart below.

THOUSANDS			ONES		
Hundreds	Tens	Ones	Hundreds	Tens	Ones

The number 262,400 has two periods, thousands and ones.

Standard Form: 262,400

Word Form: two hundred sixty-two thousand, four hundred

Expanded Form: 200,000 + 60,000 + 2,000 + 400

Math Talk — MATHEMATICAL PRACTICES 7

Look for Structure How can you use a place value chart to find which digit in a number has the greatest value?

Try This! Use place value to read and write numbers.

A Standard Form: ____________

Word Form: ninety-two thousand, one hundred seventy

Expanded Form:

90,000 + 2,000 + ____________ + 70

B Standard Form: 200,007

Word Form:
two hundred ____________, ____________

Expanded Form:

____________ + 7



Share and Show MATH BOARD

1. How can you use place value and period names to read and write 324,904 in word form?

Read and write the number in two other forms.

2. four hundred eight thousand, seventeen

3. 65,058

Math Talk

MATHEMATICAL PRACTICES 2

Symbols and Words Explain how you can use the expanded form of a number to write the number in standard form.

On Your Own

Read and write the number in two other forms.

4. five hundred eight thousand

5. forty thousand, six hundred nineteen

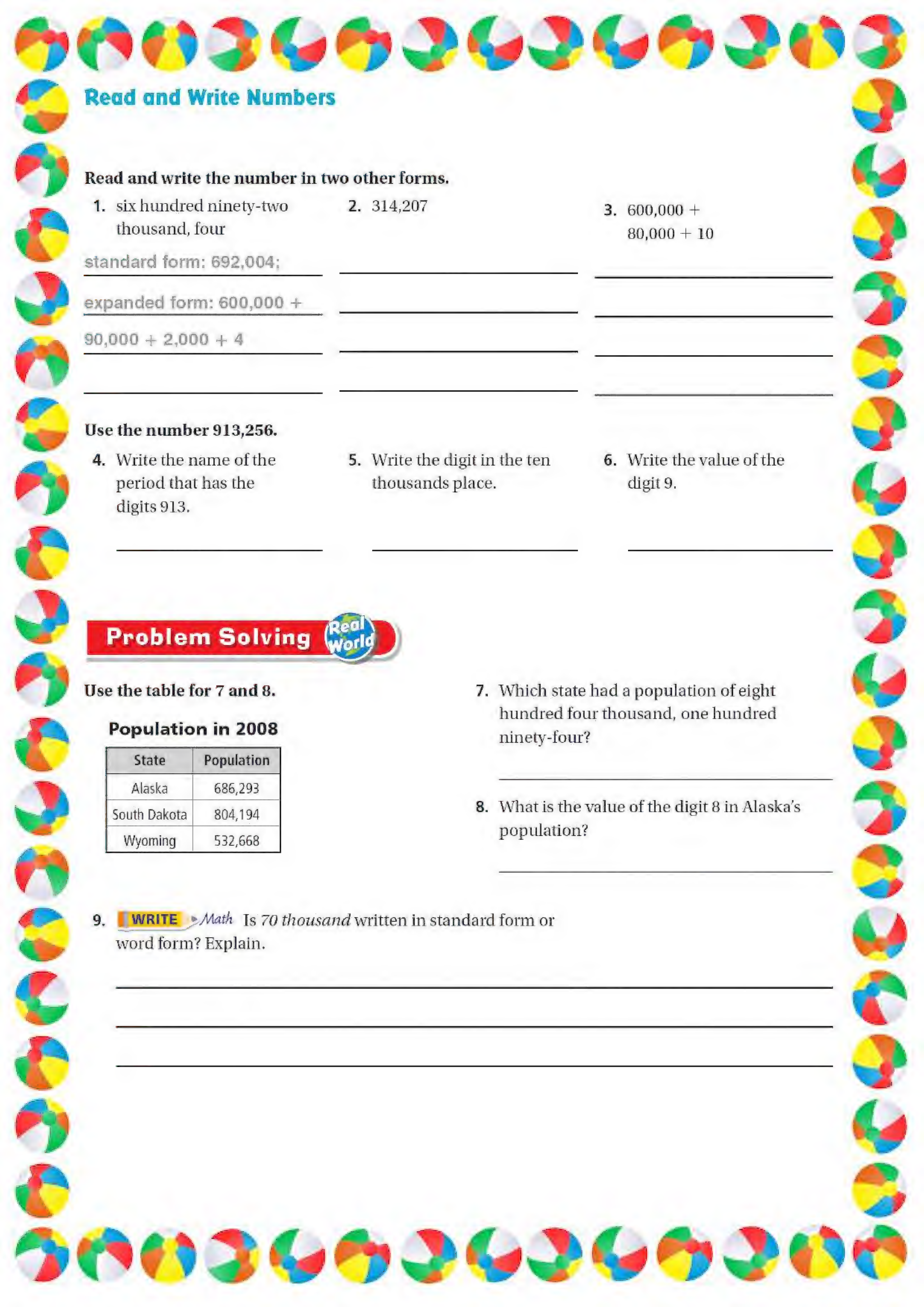
6. 570,020

7. 400,000 + 60,000 + 5,000 + 100

8. THINK SMARTER During the week of the county fair, fifteen thousand, six hundred nine entry tickets were sold. Is it correct to write the number as 15,069? Explain.

9. GO DEEPER There were 94,172 people at a football game on Saturday. On Monday, 1,000 fewer people were at a football game. In word form, how many people were at the football game on Monday?

10. Richard got 263,148 hits when he did an Internet search. What is the value of the digit 6 in this number? Explain.



Read and Write Numbers

Read and write the number in two other forms.

1. six hundred ninety-two thousand, four

standard form: 692,004;

expanded form: 600,000 + 90,000 + 2,000 + 4

2. 314,207

3. 600,000 + 80,000 + 10

Use the number 913,256.

4. Write the name of the period that has the digits 913.

5. Write the digit in the ten thousands place.

6. Write the value of the digit 9.

Problem Solving Real World

Use the table for 7 and 8.

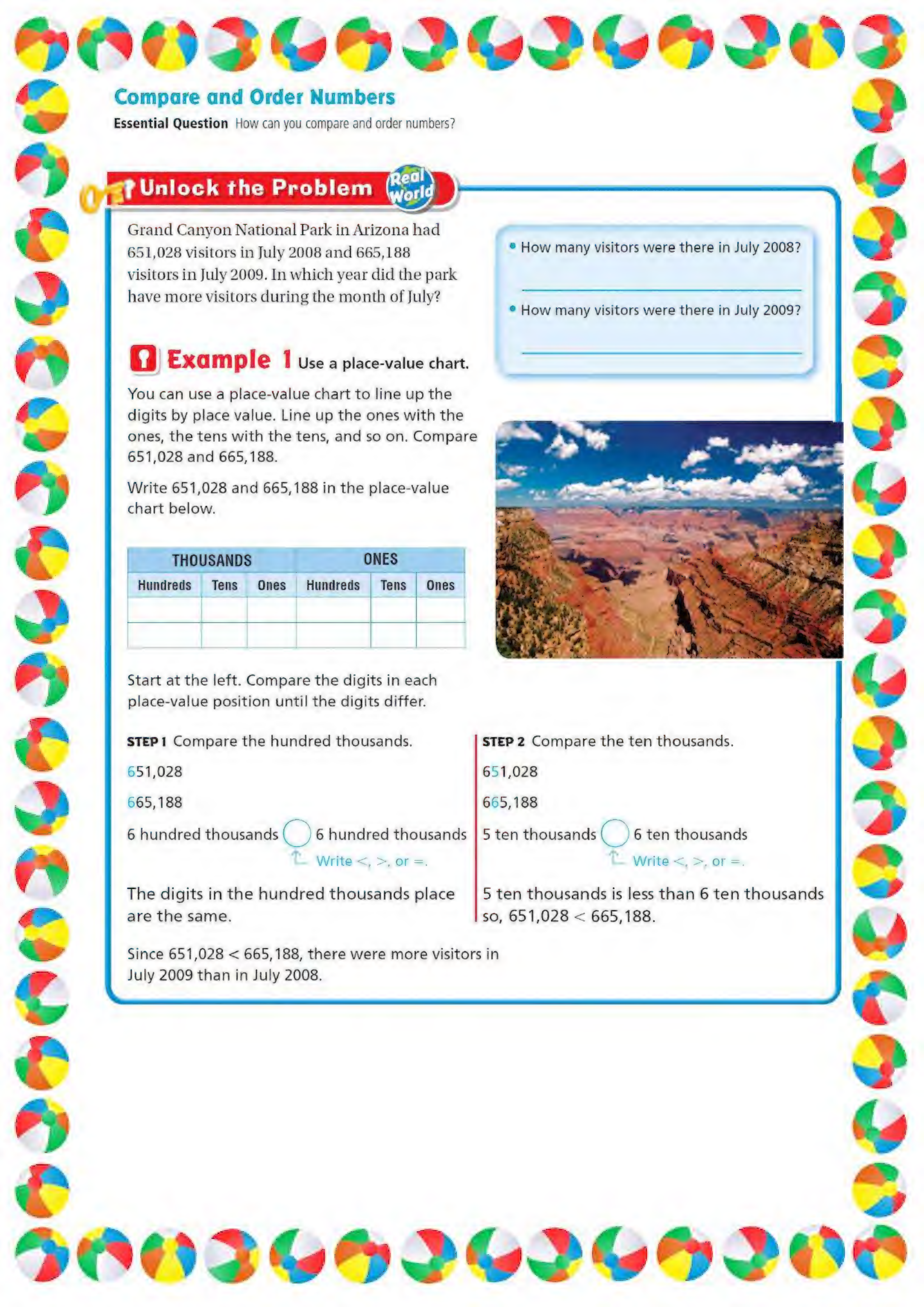
Population in 2008

State	Population
Alaska	686,293
South Dakota	804,194
Wyoming	532,668

7. Which state had a population of eight hundred four thousand, one hundred ninety-four?

8. What is the value of the digit 8 in Alaska's population?

9. WRITE Math Is *70 thousand* written in standard form or word form? Explain.



Compare and Order Numbers

Essential Question How can you compare and order numbers?

Unlock the Problem — Real World

Grand Canyon National Park in Arizona had 651,028 visitors in July 2008 and 665,188 visitors in July 2009. In which year did the park have more visitors during the month of July?

- How many visitors were there in July 2008?

____

- How many visitors were there in July 2009?

____

Example 1 Use a place-value chart.

You can use a place-value chart to line up the digits by place value. Line up the ones with the ones, the tens with the tens, and so on. Compare 651,028 and 665,188.

Write 651,028 and 665,188 in the place-value chart below.

THOUSANDS			ONES		
Hundreds	Tens	Ones	Hundreds	Tens	Ones

Start at the left. Compare the digits in each place-value position until the digits differ.

STEP 1 Compare the hundred thousands.

651,028

665,188

6 hundred thousands ◯ 6 hundred thousands

↑ Write <, >, or =.

The digits in the hundred thousands place are the same.

STEP 2 Compare the ten thousands.

651,028

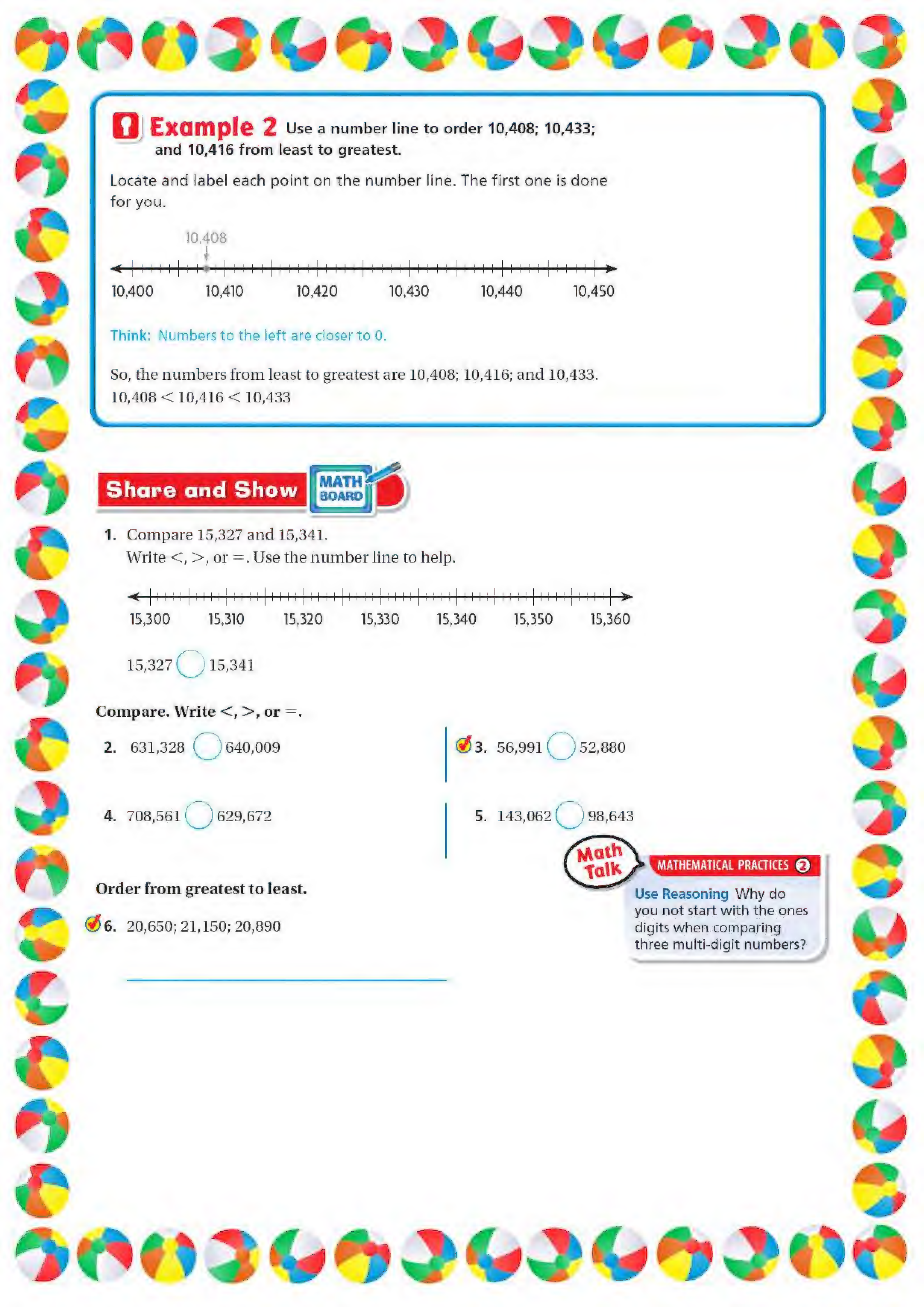
665,188

5 ten thousands ◯ 6 ten thousands

↑ Write <, >, or =.

5 ten thousands is less than 6 ten thousands so, $651{,}028 < 665{,}188$.

Since $651{,}028 < 665{,}188$, there were more visitors in July 2009 than in July 2008.



Example 2 Use a number line to order 10,408; 10,433; and 10,416 from least to greatest.

Locate and label each point on the number line. The first one is done for you.

10,408

10,400 10,410 10,420 10,430 10,440 10,450

Think: Numbers to the left are closer to 0.

So, the numbers from least to greatest are 10,408; 10,416; and 10,433.
$10{,}408 < 10{,}416 < 10{,}433$

Share and Show MATH BOARD

1. Compare 15,327 and 15,341.
   Write <, >, or =. Use the number line to help.

   15,300 15,310 15,320 15,330 15,340 15,350 15,360

   15,327 ◯ 15,341

Compare. Write <, >, or =.

2. 631,328 ◯ 640,009

3. 56,991 ◯ 52,880

4. 708,561 ◯ 629,672

5. 143,062 ◯ 98,643

Order from greatest to least.

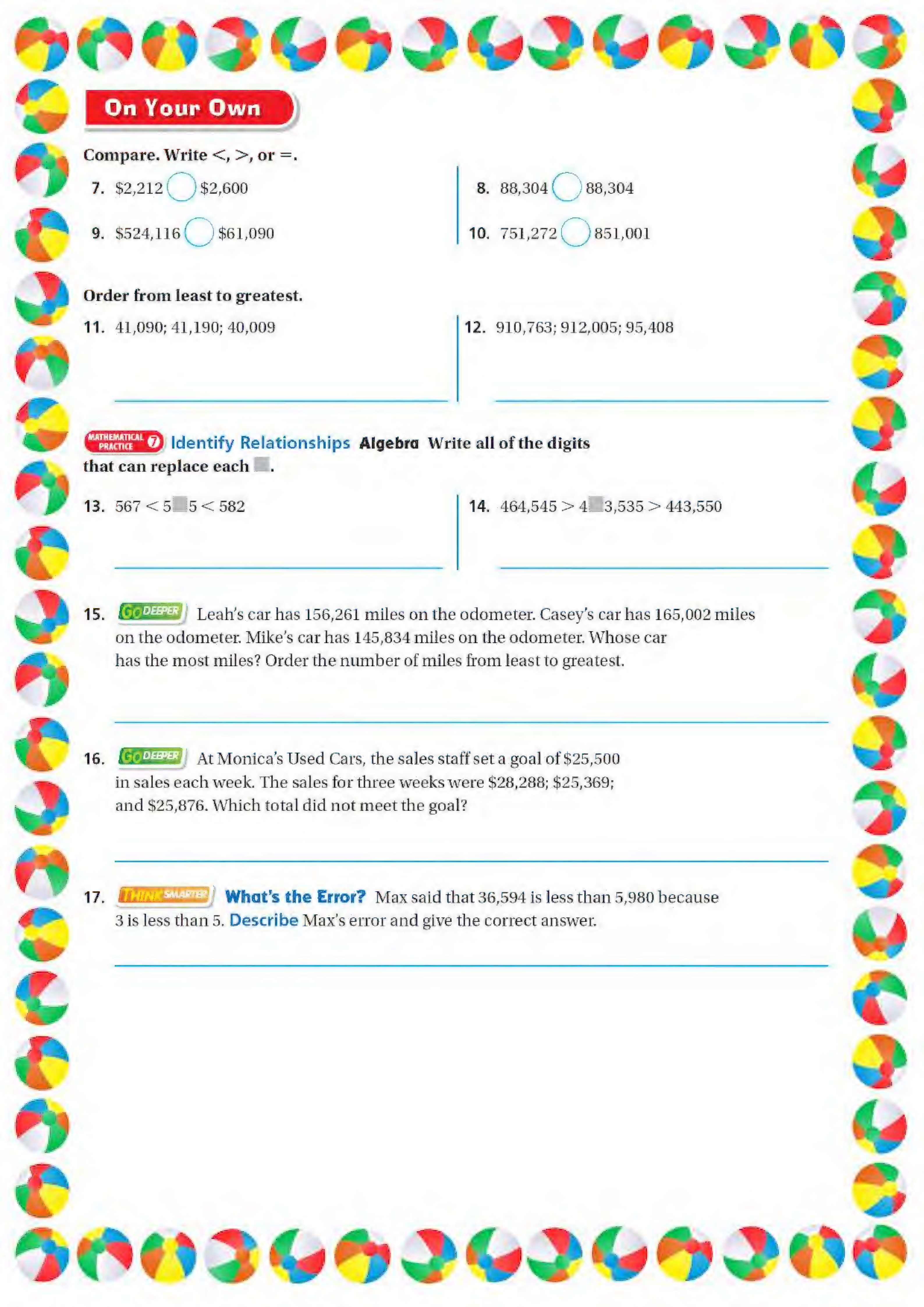
6. 20,650; 21,150; 20,890

____

Math Talk

MATHEMATICAL PRACTICES 2

Use Reasoning Why do you not start with the ones digits when comparing three multi-digit numbers?



On Your Own

Compare. Write $<$, $>$, or $=$.

7. \$2,212 ◯ \$2,600

8. 88,304 ◯ 88,304

9. \$524,116 ◯ \$61,090

10. 751,272 ◯ 851,001

Order from least to greatest.

11. 41,090; 41,190; 40,009

___

12. 910,763; 912,005; 95,408

___

MATHEMATICAL PRACTICE 7 **Identify Relationships** **Algebra** **Write all of the digits that can replace each ■.**

13. $567 < 5■5 < 582$

___

14. $464{,}545 > 4■3{,}535 > 443{,}550$

___

15. GO DEEPER Leah's car has 156,261 miles on the odometer. Casey's car has 165,002 miles on the odometer. Mike's car has 145,834 miles on the odometer. Whose car has the most miles? Order the number of miles from least to greatest.

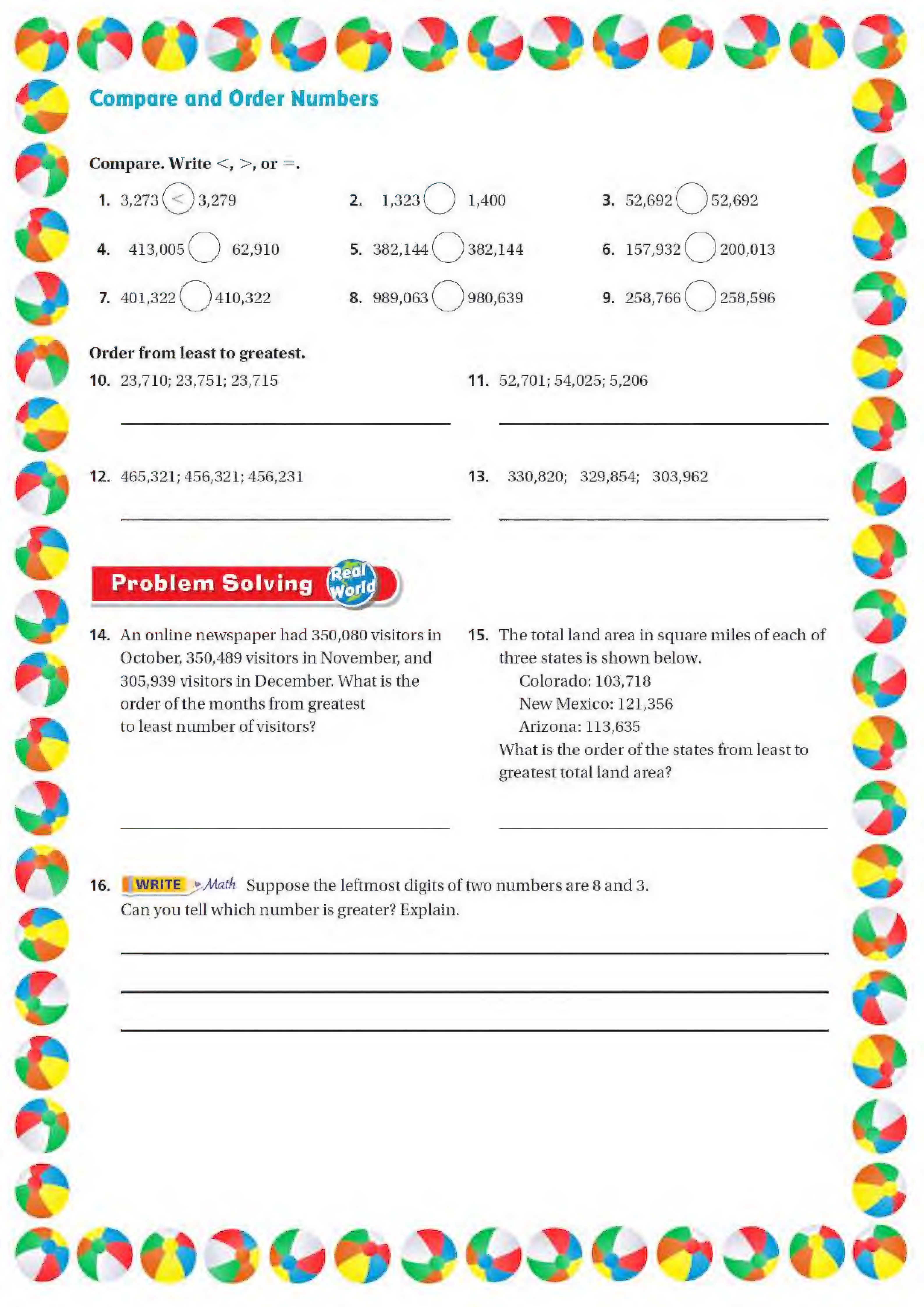
___

16. GO DEEPER At Monica's Used Cars, the sales staff set a goal of \$25,500 in sales each week. The sales for three weeks were \$28,288; \$25,369; and \$25,876. Which total did not meet the goal?

___

17. THINK SMARTER **What's the Error?** Max said that 36,594 is less than 5,980 because 3 is less than 5. **Describe** Max's error and give the correct answer.

___



Compare and Order Numbers

Compare. Write <, >, or =.

1. 3,273 (<) 3,279

2. 1,323 ◯ 1,400

3. 52,692 ◯ 52,692

4. 413,005 ◯ 62,910

5. 382,144 ◯ 382,144

6. 157,932 ◯ 200,013

7. 401,322 ◯ 410,322

8. 989,063 ◯ 980,639

9. 258,766 ◯ 258,596

Order from least to greatest.

10. 23,710; 23,751; 23,715

____

11. 52,701; 54,025; 5,206

____

12. 465,321; 456,321; 456,231

____

13. 330,820; 329,854; 303,962

____

Problem Solving Real World

14. An online newspaper had 350,080 visitors in October, 350,489 visitors in November, and 305,939 visitors in December. What is the order of the months from greatest to least number of visitors?

____

15. The total land area in square miles of each of three states is shown below.

Colorado: 103,718
New Mexico: 121,356
Arizona: 113,635

What is the order of the states from least to greatest total land area?

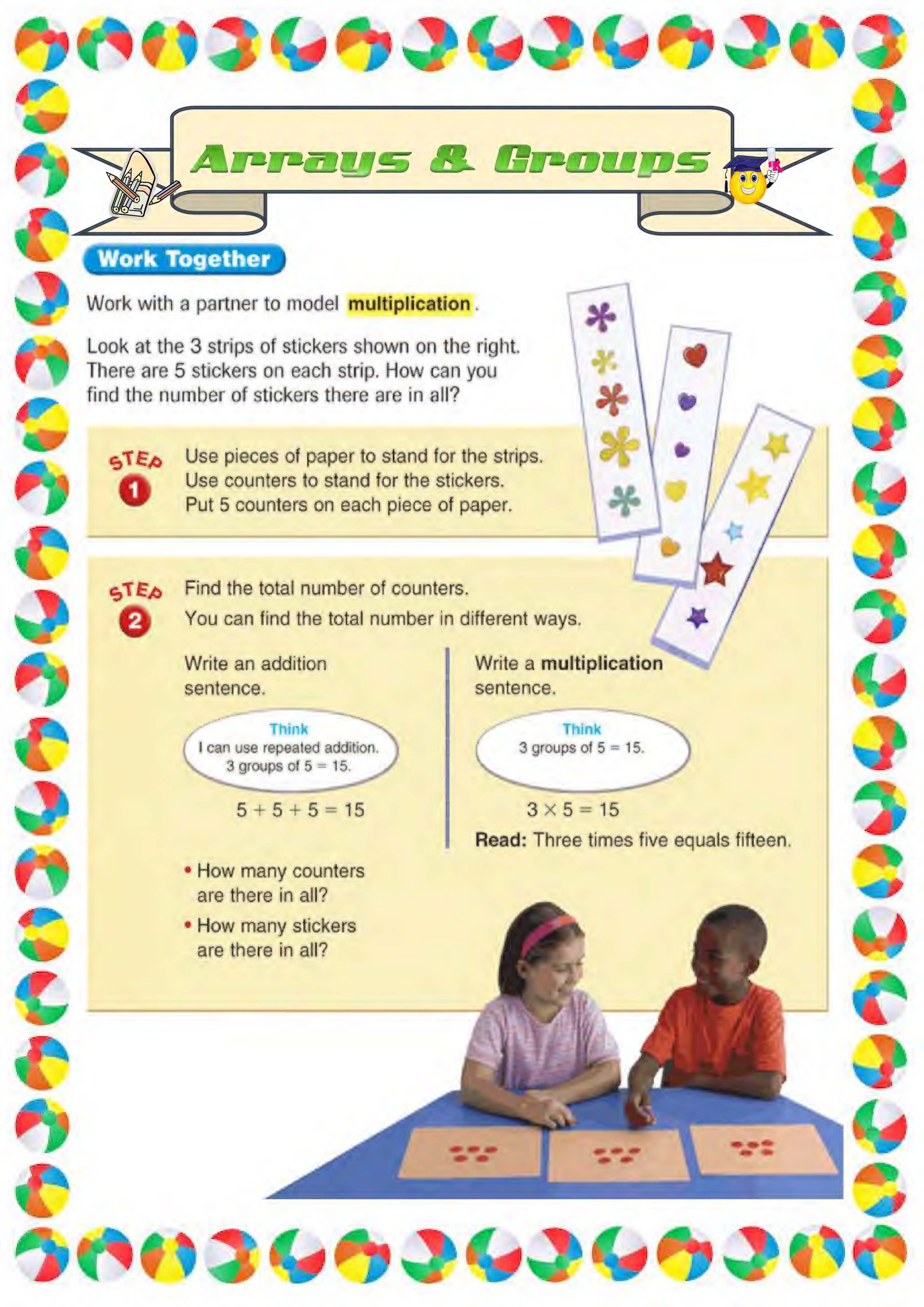
____

16. WRITE Math Suppose the leftmost digits of two numbers are 8 and 3. Can you tell which number is greater? Explain.

____

____

____



Arrays & Groups

Work Together

Work with a partner to model **multiplication**.

Look at the 3 strips of stickers shown on the right. There are 5 stickers on each strip. How can you find the number of stickers there are in all?

STEP 1

Use pieces of paper to stand for the strips.
Use counters to stand for the stickers.
Put 5 counters on each piece of paper.

STEP 2

Find the total number of counters.
You can find the total number in different ways.

Write an addition sentence.

Think
I can use repeated addition.
3 groups of 5 = 15.

$5 + 5 + 5 = 15$

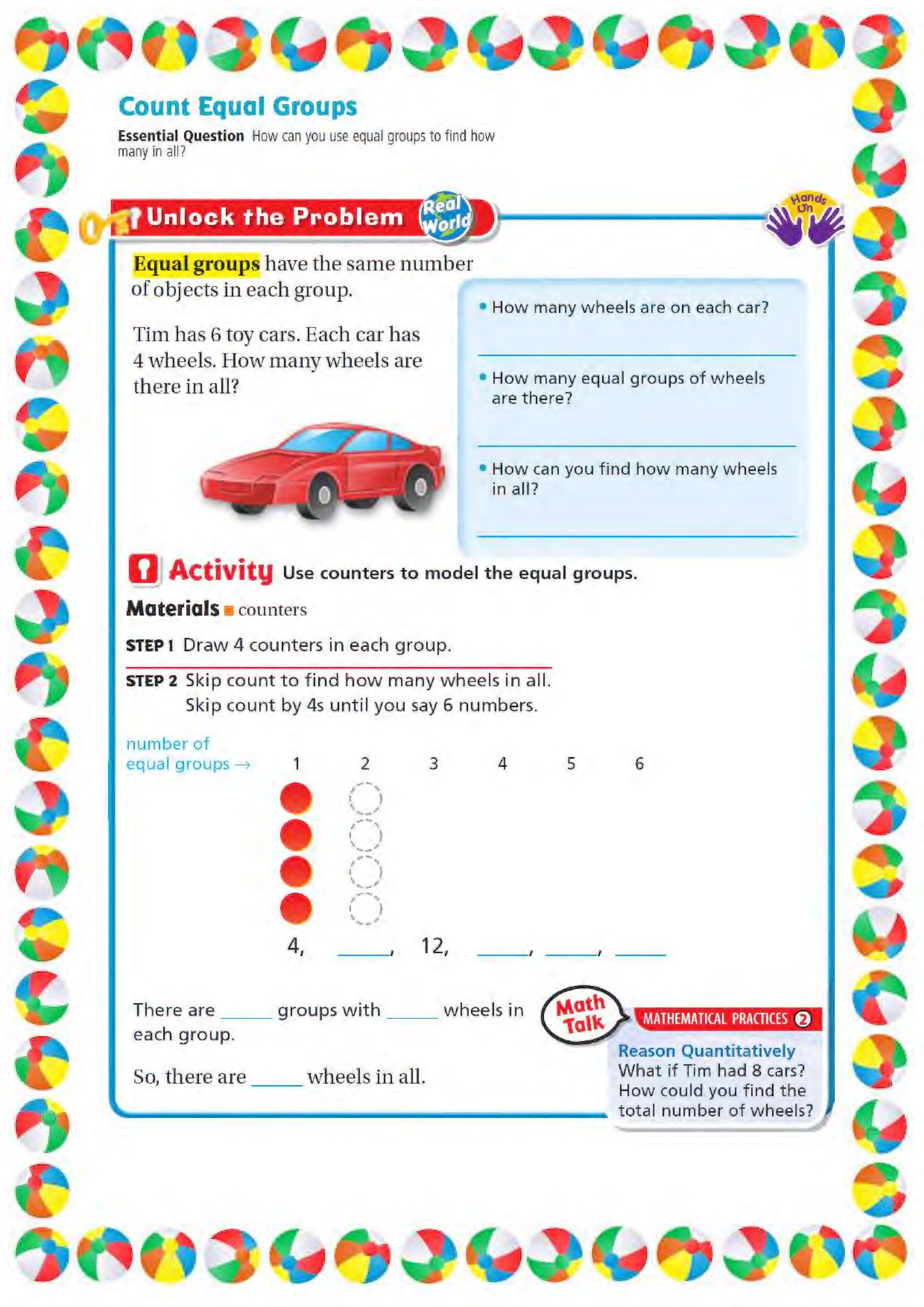
Write a **multiplication** sentence.

Think
3 groups of 5 = 15.

$3 \times 5 = 15$

Read: Three times five equals fifteen.

- How many counters are there in all?
- How many stickers are there in all?



Count Equal Groups

Essential Question How can you use equal groups to find how many in all?

Unlock the Problem

Real World

Hands On

Equal groups have the same number of objects in each group.

Tim has 6 toy cars. Each car has 4 wheels. How many wheels are there in all?

- How many wheels are on each car?

____

- How many equal groups of wheels are there?

____

- How can you find how many wheels in all?

____

Activity Use counters to model the equal groups.

Materials ■ counters

STEP 1 Draw 4 counters in each group.

STEP 2 Skip count to find how many wheels in all. Skip count by 4s until you say 6 numbers.

number of equal groups → 1 2 3 4 5 6

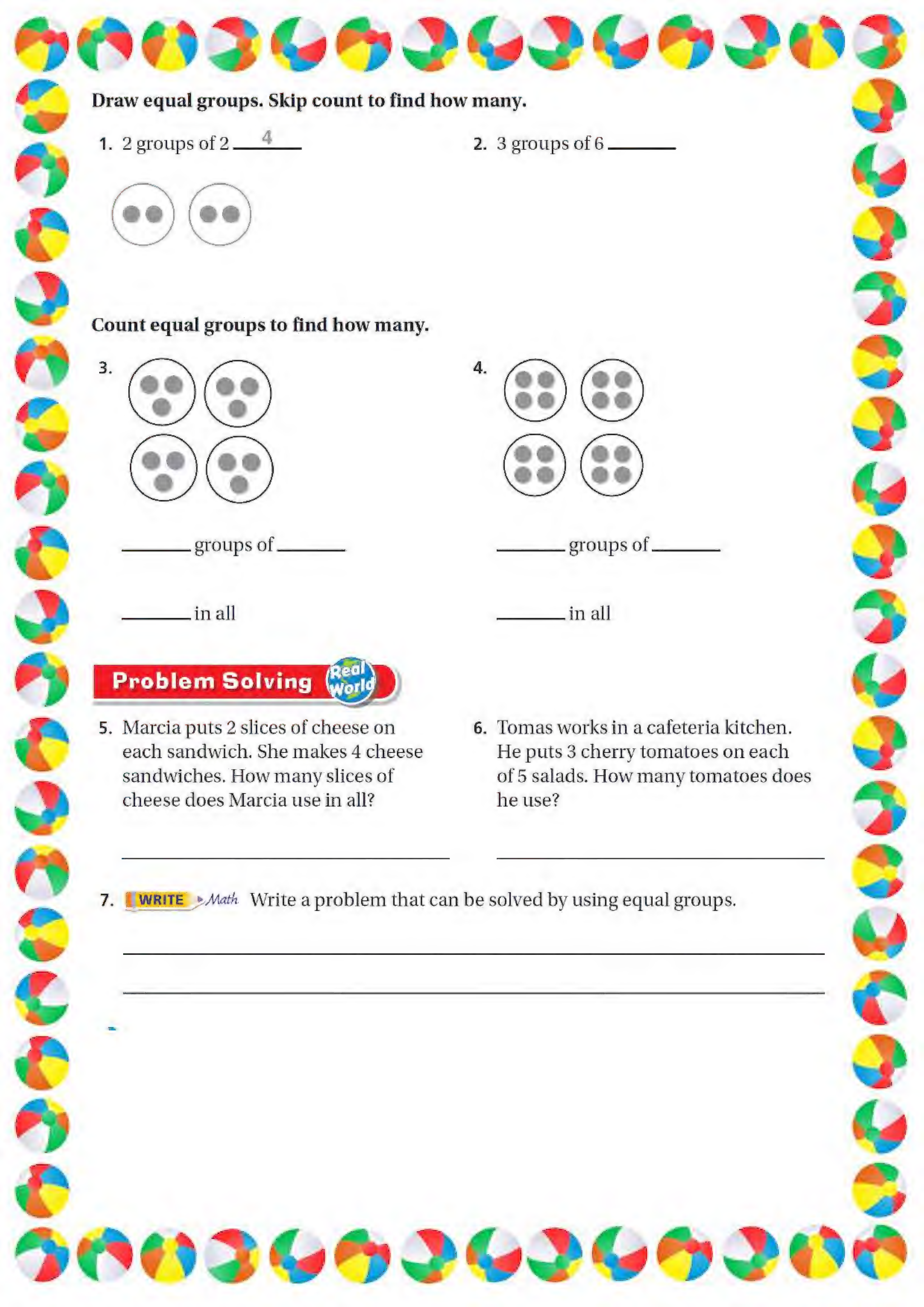
4, _____, 12, _____, _____, _____

There are _____ groups with _____ wheels in each group.

So, there are _____ wheels in all.

Math Talk MATHEMATICAL PRACTICES 2

Reason Quantitatively What if Tim had 8 cars? How could you find the total number of wheels?



Draw equal groups. Skip count to find how many.

1. 2 groups of 2 ___4___

2. 3 groups of 6 ______

Count equal groups to find how many.

3. ______ groups of ______

______ in all

4. ______ groups of ______

______ in all

Problem Solving Real World

5. Marcia puts 2 slices of cheese on each sandwich. She makes 4 cheese sandwiches. How many slices of cheese does Marcia use in all?

____

6. Tomas works in a cafeteria kitchen. He puts 3 cherry tomatoes on each of 5 salads. How many tomatoes does he use?

____

7. WRITE Math Write a problem that can be solved by using equal groups.

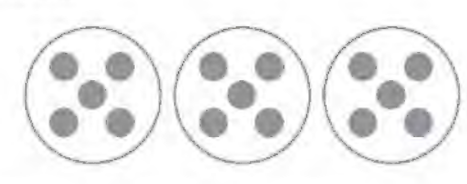
____

____

Relate Addition and Multiplication

Draw a quick picture to show the equal groups. Then write related addition and multiplication sentences.

1. 3 groups of 5



5 + 5 + 5 = 15

3 × 5 = 15

2. 3 groups of 4

___ + ___ + ___ = ___

___ × ___ = ___

3. 5 groups of 2

___ + ___ + ___ + ___ + ___ = ___

___ × ___ = ___

Complete. Write a multiplication sentence.

4. 7 + 7 + 7 = ___

___ × ___ = ___

5. 3 + 3 + 3 = ___

___ × ___ = ___

Problem Solving Real World

6. There are 6 jars of pickles in a box. Ed has 3 boxes of pickles. How many jars of pickles does he have? Write a multiplication sentence to find the answer.

___ × ___ = ___ jars

7. Each day, Jani rides her bike 5 miles. How many miles does Jani ride in 4 days? Write a multiplication sentence to find the answer.

___ × ___ = ___ miles

8. WRITE Math Write a word problem that involves combining three equal groups.

___

___



Arrays and Multiplication

MAIN IDEA

I will use arrays to multiply.

Standard 3AF1.5 **Recognize and use the Commutative** and Associative **Properties of Multiplication (e.g., if 5 × 7 = 35, then what is 7 × 5?** and if 5 × 7 × 3 = 105, then what is 7 × 3 × 5?).

New Vocabulary

array

Commutative Property of Multiplication

GET READY to Learn

Roberto places party cups on a table in 3 rows of 5 cups each. How many cups are there on the table?



The cups are arranged in equal rows and equal columns. This arrangement is an **array**.

Real-World EXAMPLES Use an Array

1 PARTY CUPS How many cups are on the table?

To find the total number of cups, you can use addition or multiplication. There are 3 rows with 5 cups in each row.

One Way: Add	Another Way: Multiply
5 + 5 + 5 = 15	3 × 5 = 15

So, 3 equal groups of 5 cups is 15 in all.

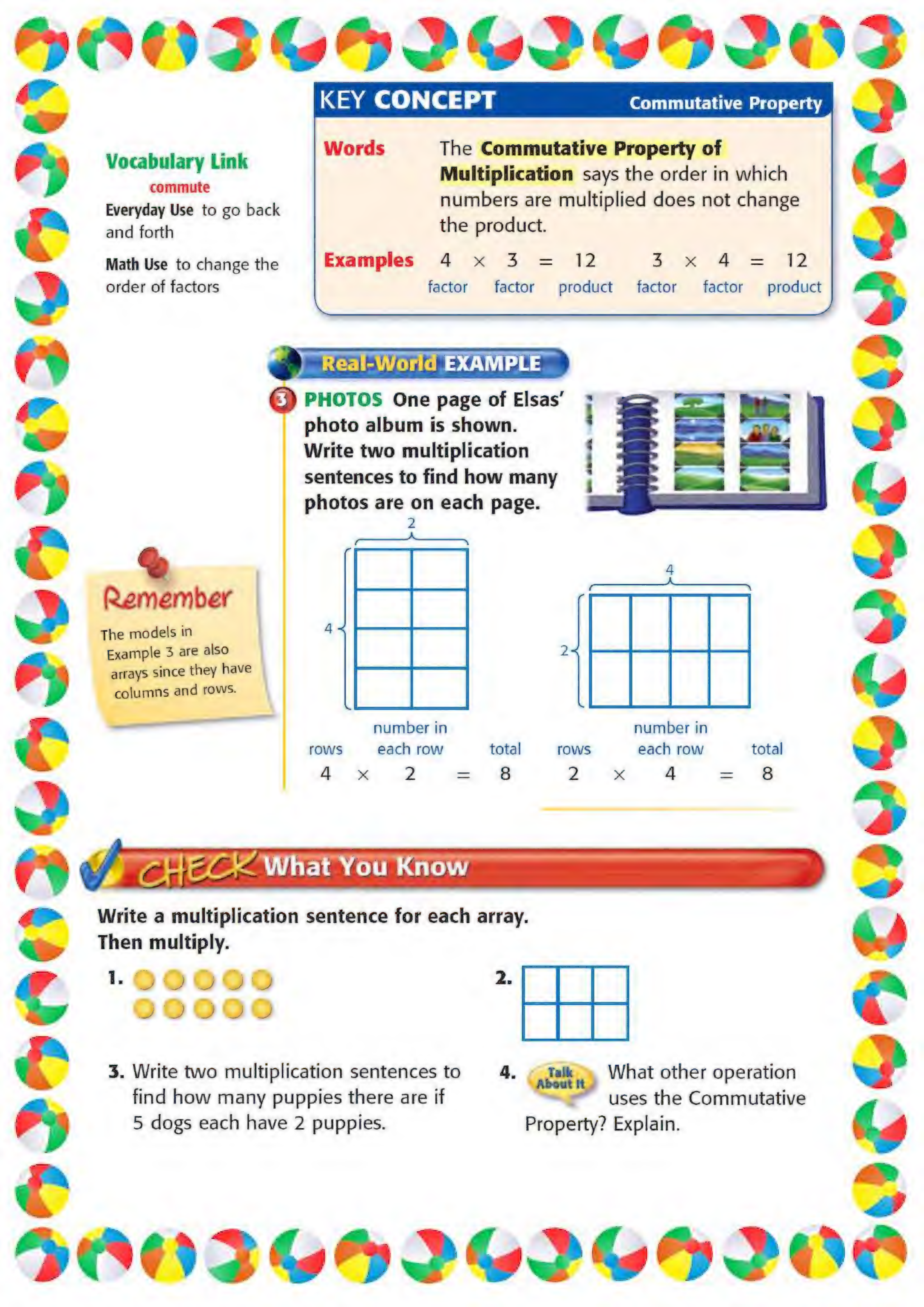
2 FOOD How many eggs are in a carton of eggs?



To find the total number in the array of eggs, you can write a multiplication sentence.

2 × 6 = 12

So, 2 rows of 6 eggs is 12.



KEY CONCEPT — Commutative Property

Words The **Commutative Property of Multiplication** says the order in which numbers are multiplied does not change the product.

Examples

4	×	3	=	12		3	×	4	=	12
factor		factor		product		factor		factor		product

Vocabulary Link

commute

Everyday Use to go back and forth

Math Use to change the order of factors

Real-World EXAMPLE

3 **PHOTOS** **One page of Elsas' photo album is shown. Write two multiplication sentences to find how many photos are on each page.**

rows	number in each row		total
4 ×	2	=	8

rows	number in each row		total
2 ×	4	=	8

Remember

The models in Example 3 are also arrays since they have columns and rows.

CHECK What You Know

Write a multiplication sentence for each array. Then multiply.

1.

2.

3. Write two multiplication sentences to find how many puppies there are if 5 dogs each have 2 puppies.

4. Talk About It What other operation uses the Commutative Property? Explain.



Share and Show 

1. Complete. Use the array.



_____ rows of _____ = _____

_____ × _____ = _____



Write a multiplication sentence for the array.

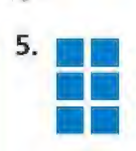
2. ______________

3.  ______________

On Your Own

Write a multiplication sentence for the array.

4. ______________

5.  ______________

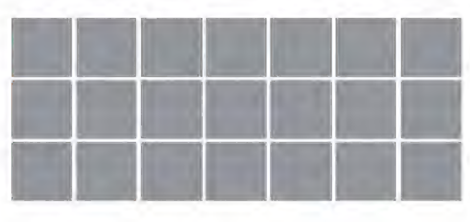
Draw an array to find the product.

6. $3 \times 6 =$ _____

7. $4 \times 7 =$ _____



Write a multiplication sentence for the array.

1. 

$3 \times 7 =$ 21

2. $2 \times 5 =$ _____

Draw an array to find the product.

3. $4 \times 2 =$ _____

4. $2 \times 8 =$ _____



Directions: Look at each star array and record the number of ROWS and the number of stars in each ROW. Then find the total number of stars. Use the work space on the next page to show how you found the total.

1.

Number of rows: ________

Number of stars in each row: ________

Total number of stars: ________

2.

Number of rows: ________

Number of stars in each row: ________

Total number of stars: ________

3.

Number of rows: ________

Number of stars in each row: ________

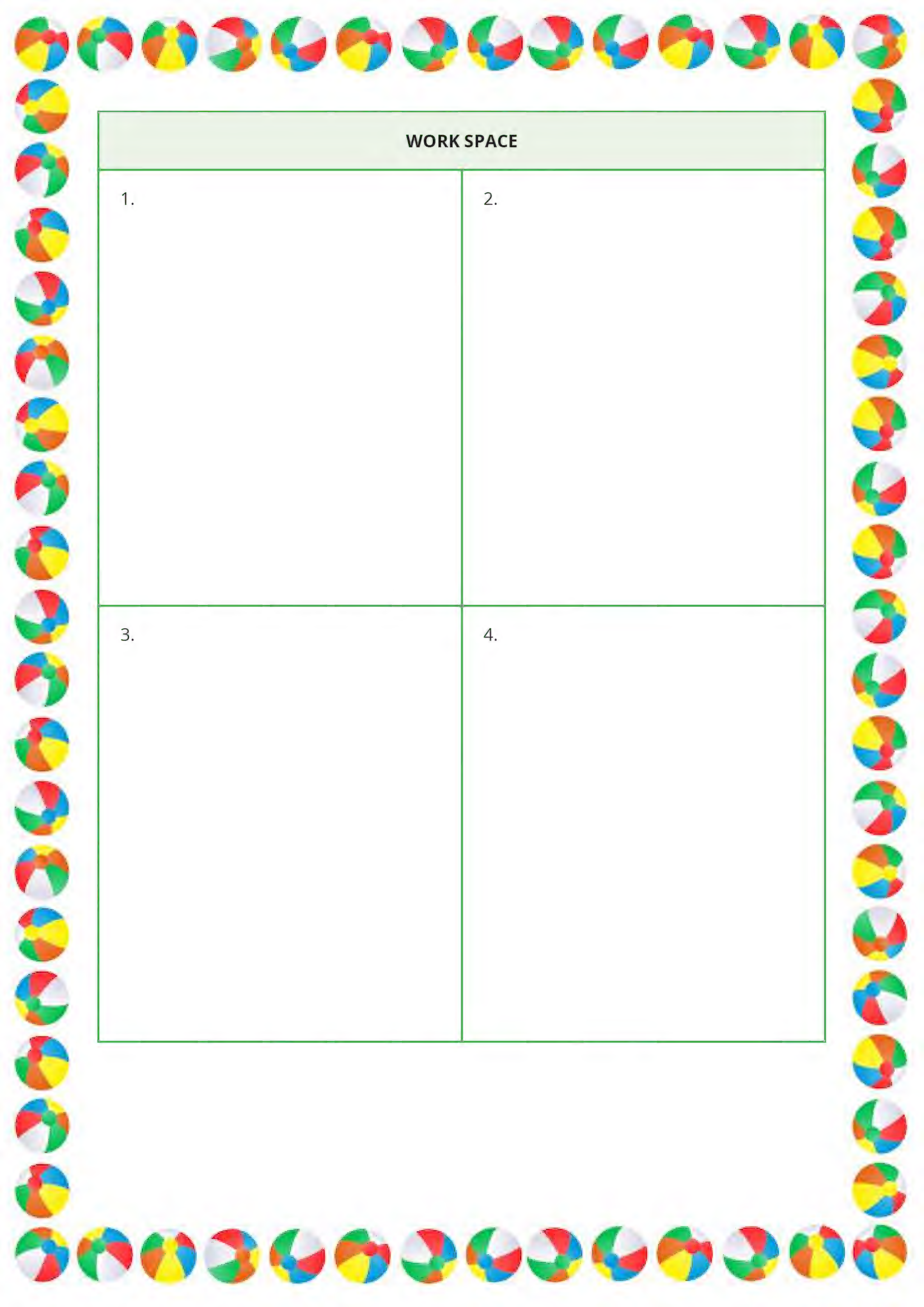
Total number of stars: ________

4.

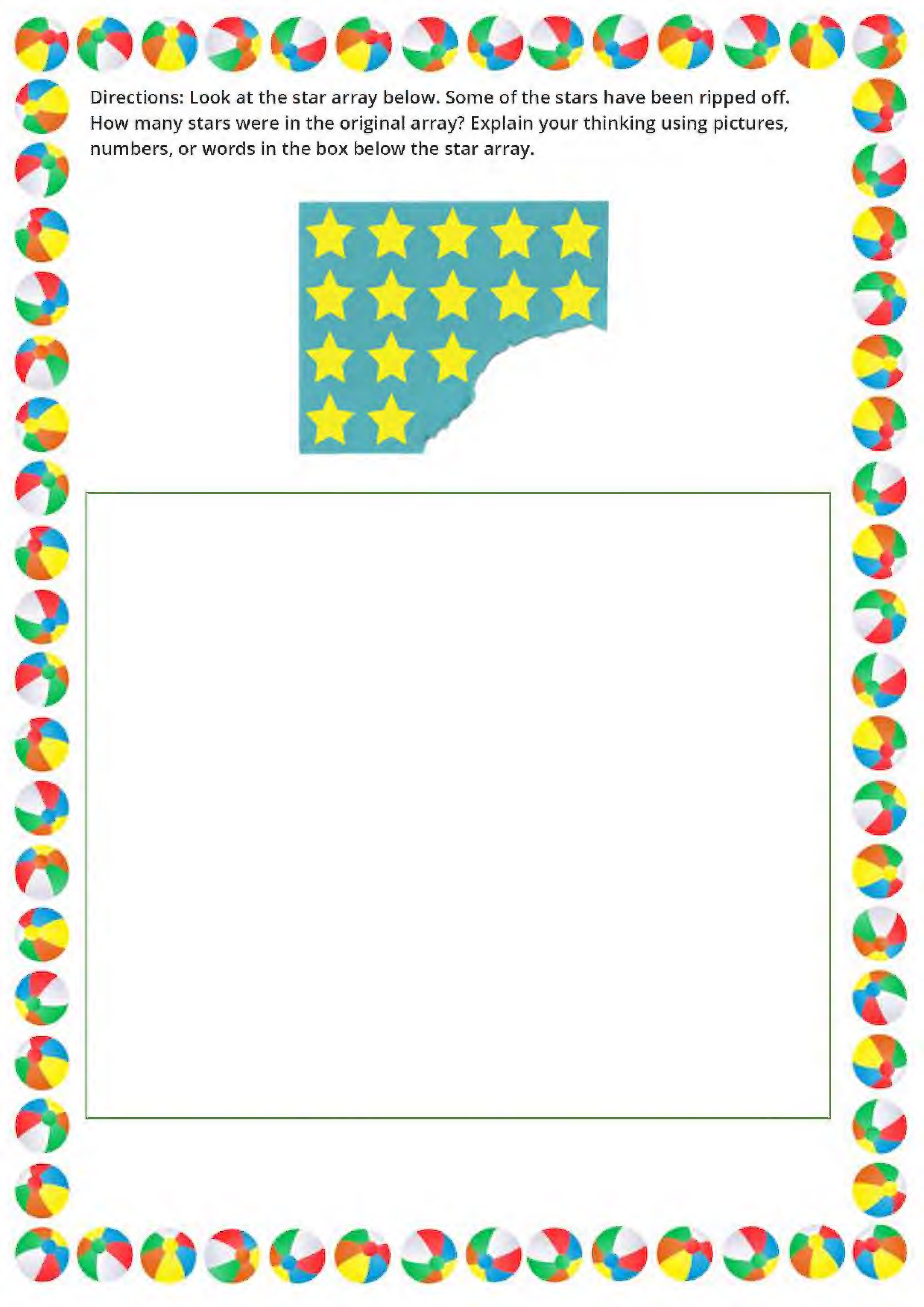
Number of rows: ________

Number of stars in each row: ________

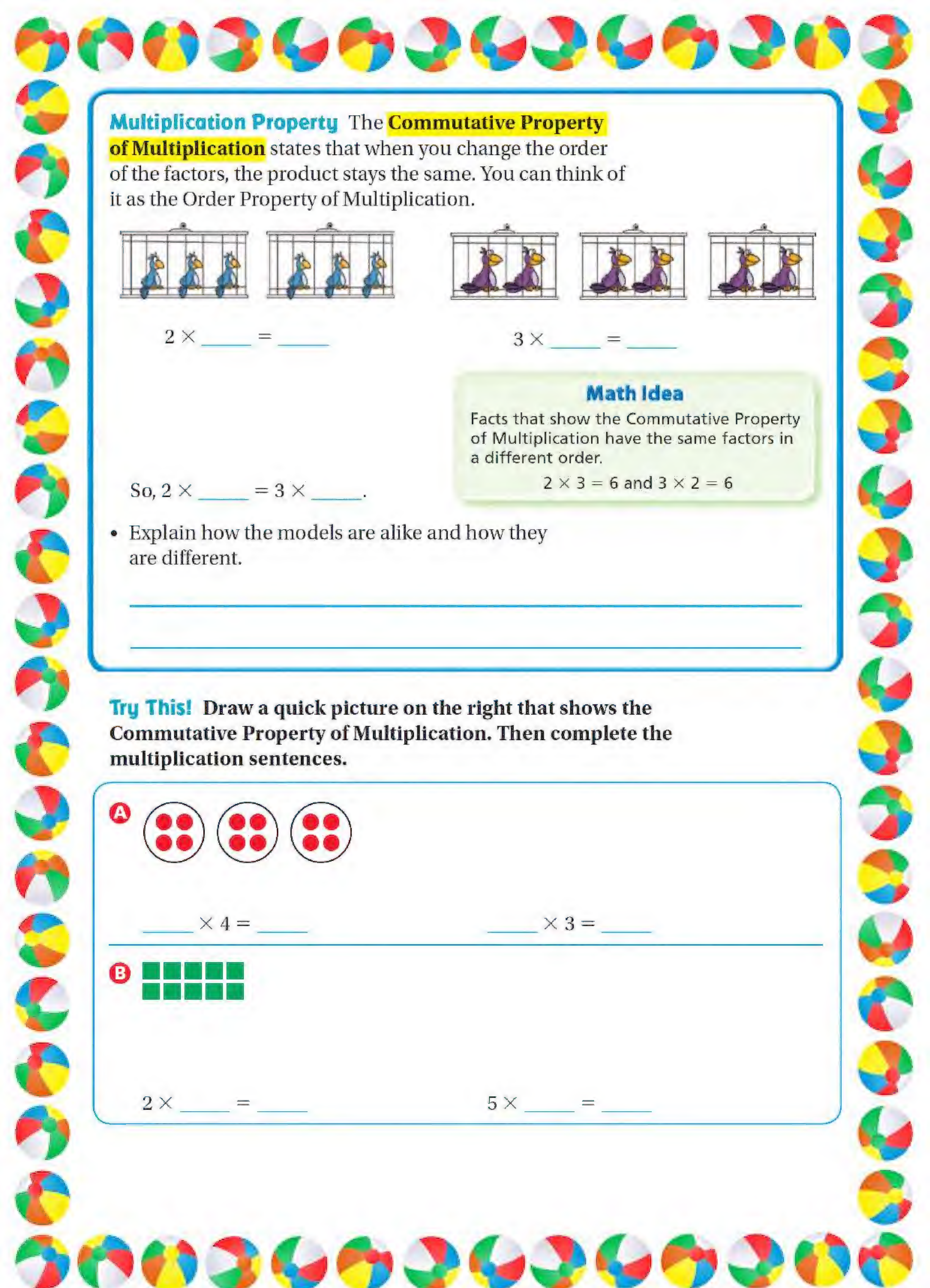
Total number of stars: ________



WORK SPACE	
1.	2.
3.	4.



Directions: Look at the star array below. Some of the stars have been ripped off. How many stars were in the original array? Explain your thinking using pictures, numbers, or words in the box below the star array.



Multiplication Property The **Commutative Property of Multiplication** states that when you change the order of the factors, the product stays the same. You can think of it as the Order Property of Multiplication.

2 × _____ = _____

3 × _____ = _____

Math Idea

Facts that show the Commutative Property of Multiplication have the same factors in a different order.

2 × 3 = 6 and 3 × 2 = 6

So, 2 × _____ = 3 × _____.

- Explain how the models are alike and how they are different.

_____

_____

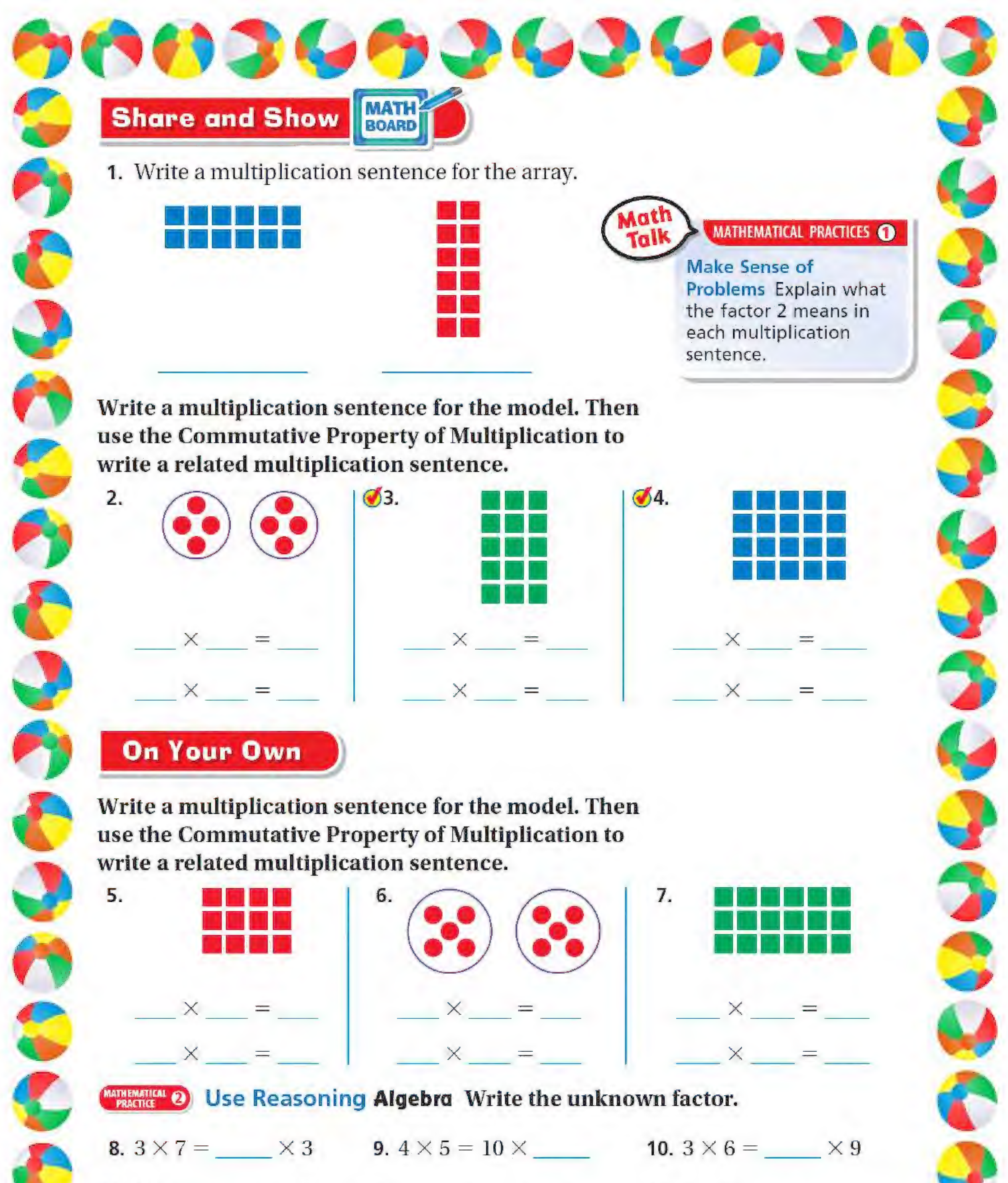
Try This! **Draw a quick picture on the right that shows the Commutative Property of Multiplication. Then complete the multiplication sentences.**

A

_____ × 4 = _____ _____ × 3 = _____

B

2 × _____ = _____ 5 × _____ = _____



Share and Show

MATH BOARD

1. Write a multiplication sentence for the array.

______ ______

Math Talk MATHEMATICAL PRACTICES 1

Make Sense of Problems Explain what the factor 2 means in each multiplication sentence.

Write a multiplication sentence for the model. Then use the Commutative Property of Multiplication to write a related multiplication sentence.

2. ___ × ___ = ___
___ × ___ = ___

3. ___ × ___ = ___
___ × ___ = ___

4. ___ × ___ = ___
___ × ___ = ___

On Your Own

Write a multiplication sentence for the model. Then use the Commutative Property of Multiplication to write a related multiplication sentence.

5. ___ × ___ = ___
___ × ___ = ___

6. ___ × ___ = ___
___ × ___ = ___

7. ___ × ___ = ___
___ × ___ = ___

MATHEMATICAL PRACTICE 2 **Use Reasoning** **Algebra** **Write the unknown factor.**

8. $3 \times 7 =$ ___ $\times 3$

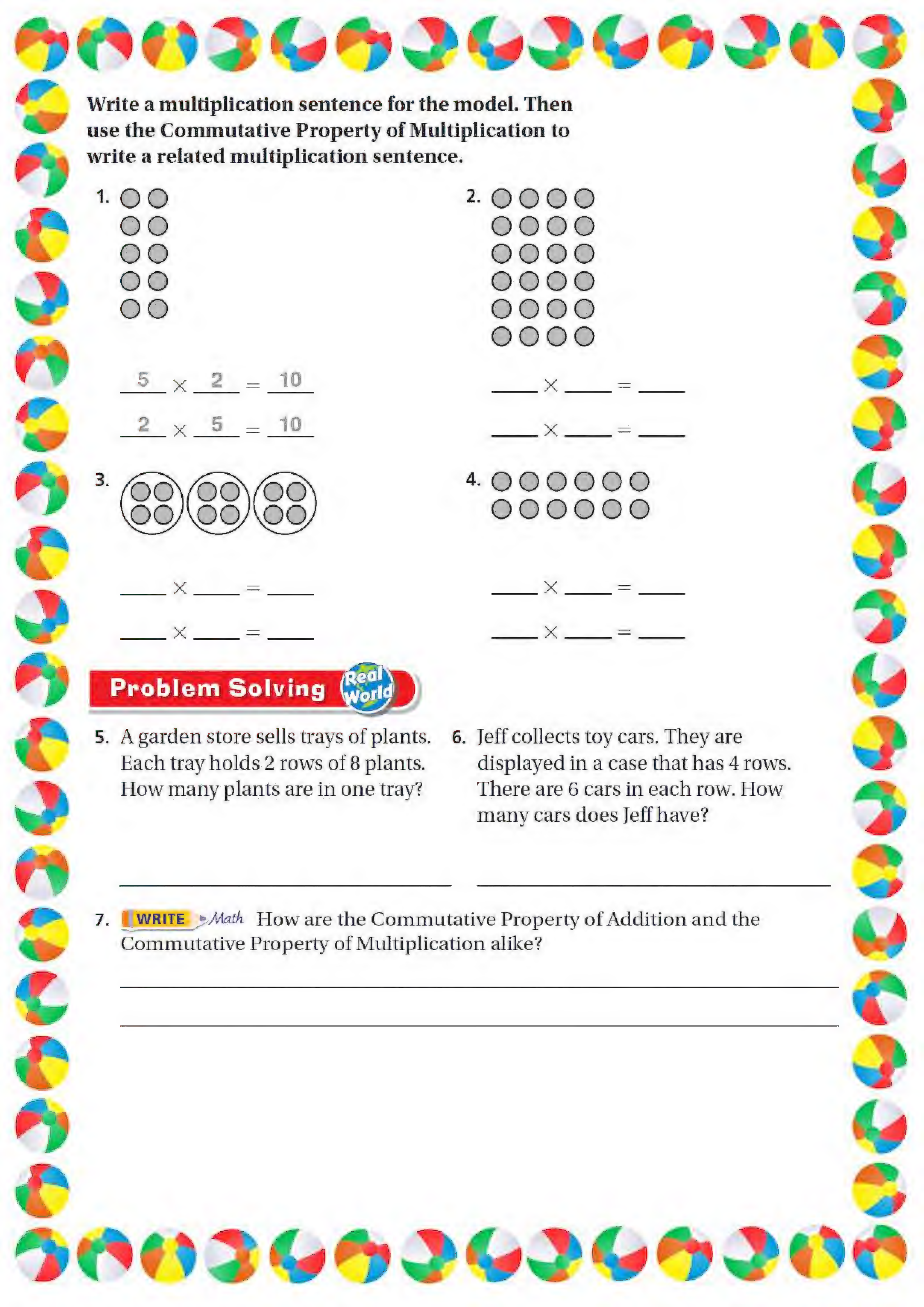
9. $4 \times 5 = 10 \times$ ___

10. $3 \times 6 =$ ___ $\times 9$

11. $6 \times$ ___ $= 4 \times 9$

12. ___ $\times 8 = 4 \times 6$

13. $5 \times 8 = 8 \times$ ___



Write a multiplication sentence for the model. Then use the Commutative Property of Multiplication to write a related multiplication sentence.

1.

5 × 2 = 10

2 × 5 = 10

2.

____ × ____ = ____

____ × ____ = ____

3.

____ × ____ = ____

____ × ____ = ____

4.

____ × ____ = ____

____ × ____ = ____

Problem Solving Real World

5. A garden store sells trays of plants. Each tray holds 2 rows of 8 plants. How many plants are in one tray?

____

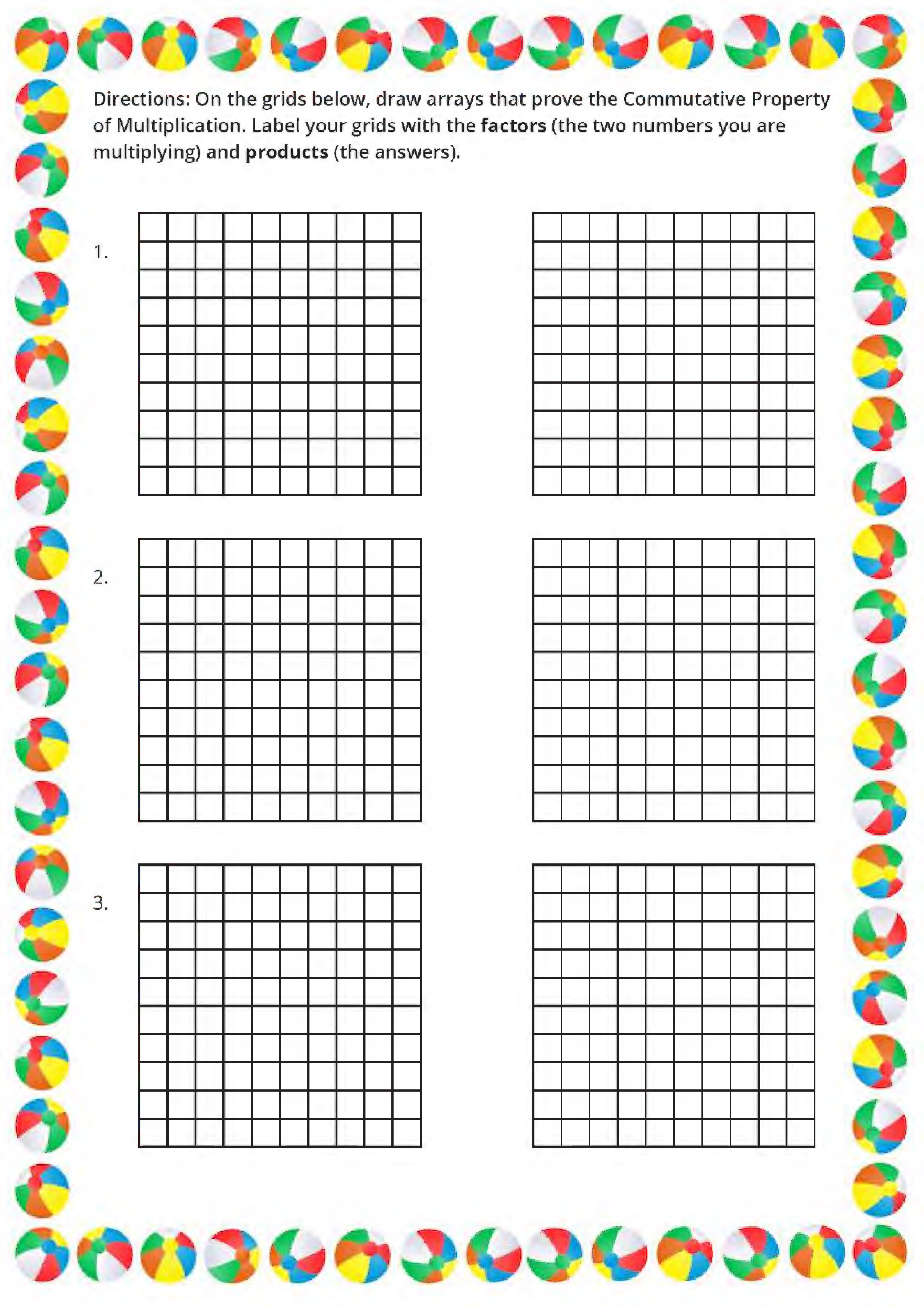
6. Jeff collects toy cars. They are displayed in a case that has 4 rows. There are 6 cars in each row. How many cars does Jeff have?

____

7. WRITE Math How are the Commutative Property of Addition and the Commutative Property of Multiplication alike?

____

____



Directions: On the grids below, draw arrays that prove the Commutative Property of Multiplication. Label your grids with the **factors** (the two numbers you are multiplying) and **products** (the answers).

1.

2.

3.


Chapter
Three



Example problem: Farha went to the store to buy rolls for a big family dinner. At the store, she bought 4 bags of rolls. Each bag contained 5 rolls. How many rolls did Farha buy?

Work Space:

Multiplication equation: ______________________________

PRACTICE:

- **Read each problem carefully.**
- **Show your thinking with pictures, numbers, and/or words.**
- **Record a multiplication equation that represents this problem.**

1. On Samira's walk home she saw 6 cars. If each car has 4 wheels, how many wheels did she see in all?

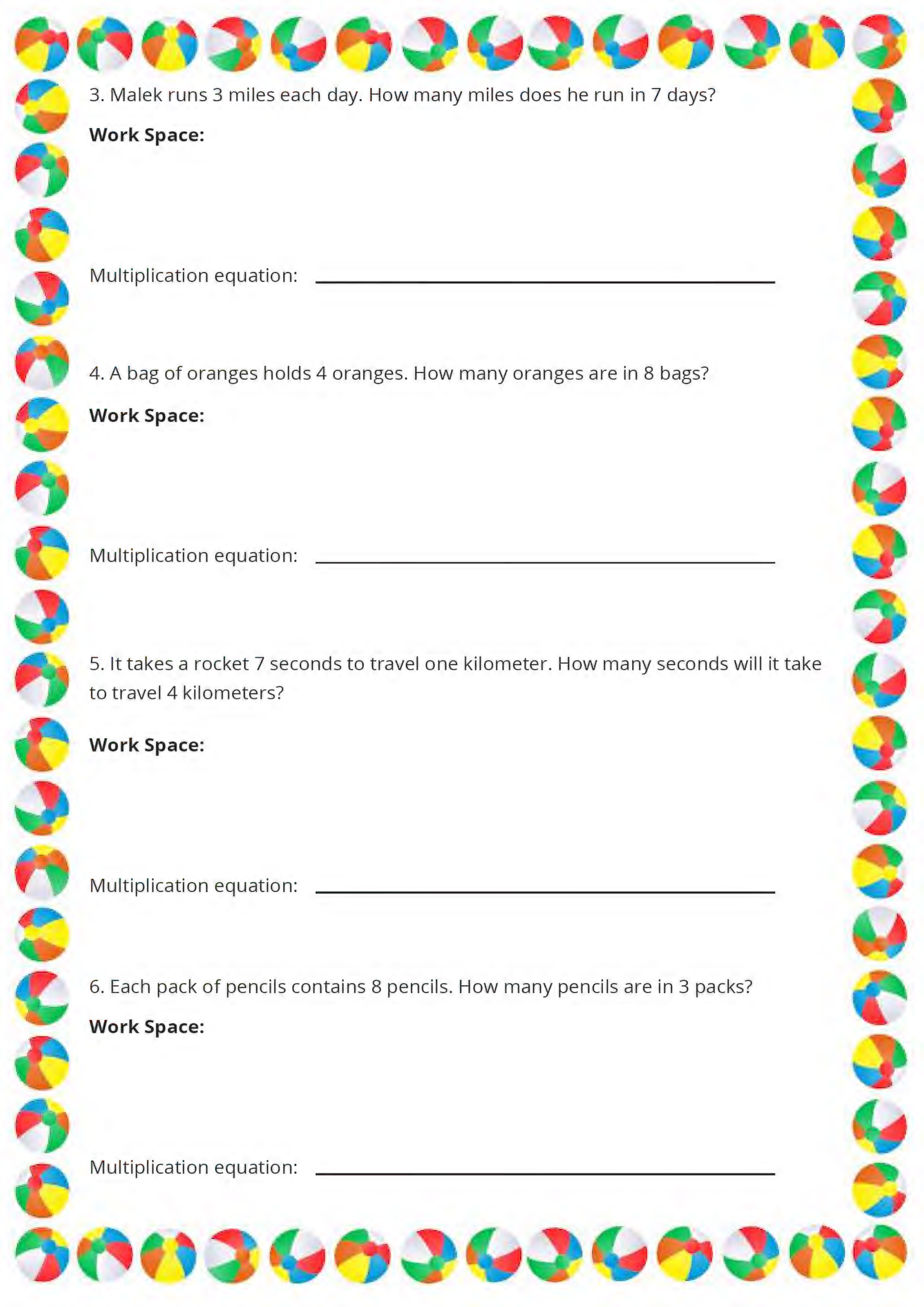
Work Space:

Multiplication equation: ______________________________

2. Manal brought 6 bags of cookies to school. Each bag had 3 cookies in it. How many cookies were there all together?

Work Space:

Multiplication equation: ______________________________



3. Malek runs 3 miles each day. How many miles does he run in 7 days?

Work Space:

Multiplication equation: ______________________________

4. A bag of oranges holds 4 oranges. How many oranges are in 8 bags?

Work Space:

Multiplication equation: ______________________________

5. It takes a rocket 7 seconds to travel one kilometer. How many seconds will it take to travel 4 kilometers?

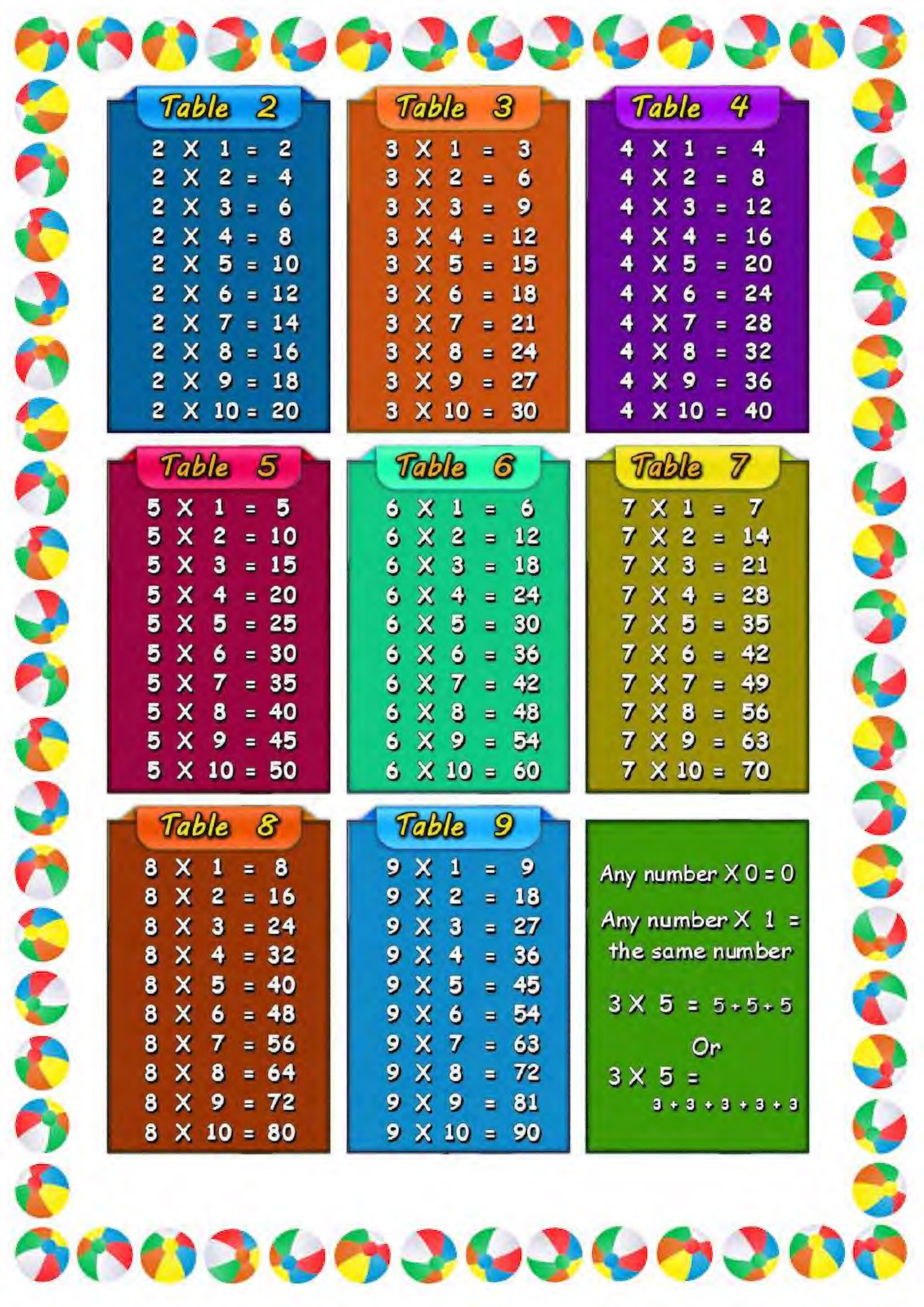
Work Space:

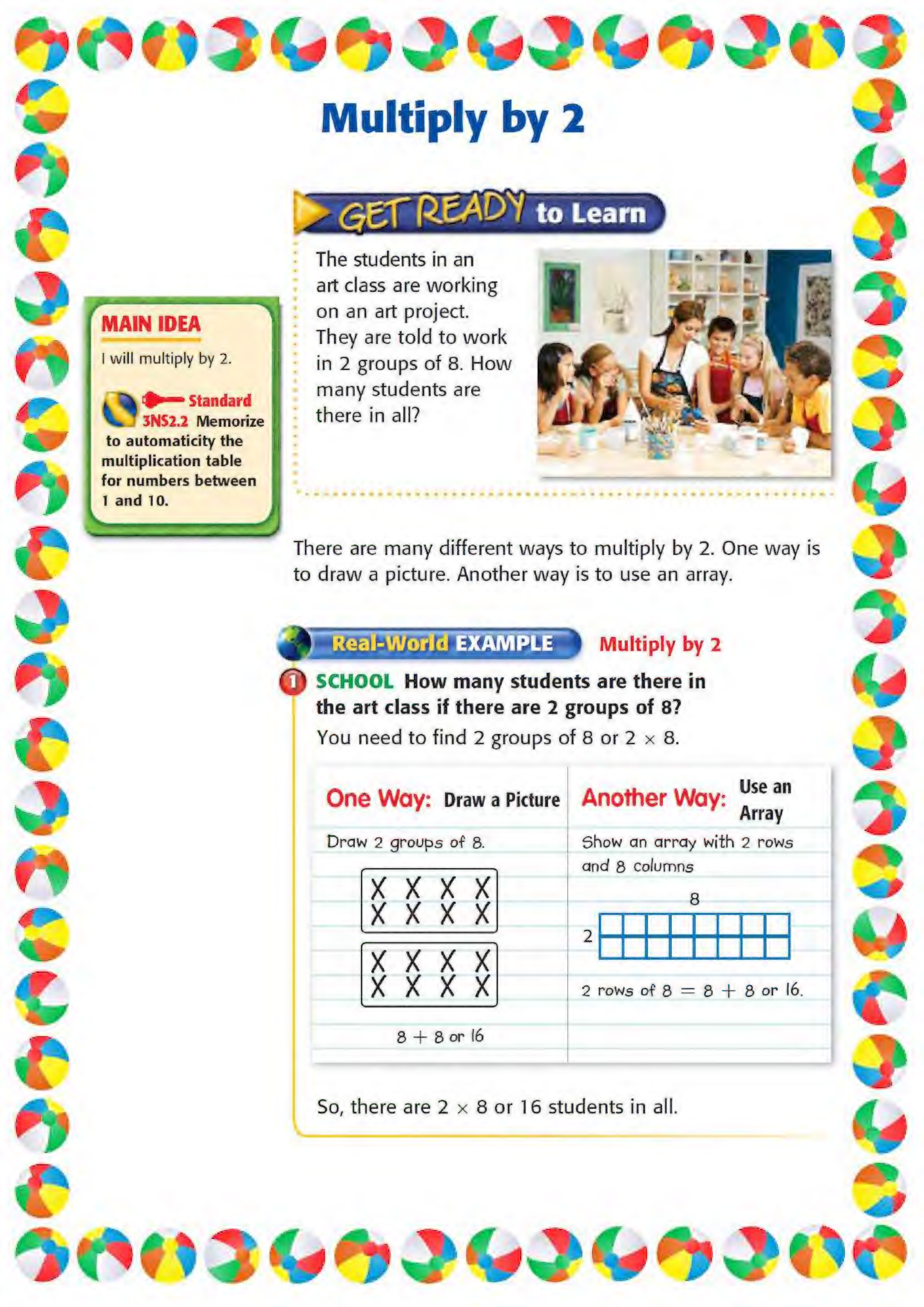
Multiplication equation: ______________________________

6. Each pack of pencils contains 8 pencils. How many pencils are in 3 packs?

Work Space:

Multiplication equation: ______________________________


Table 2
2 X 1 = 2
2 X 2 = 4
2 X 3 = 6
2 X 4 = 8
2 X 5 = 10
2 X 6 = 12
2 X 7 = 14
2 X 8 = 16
2 X 9 = 18
2 X 10 = 20
Table 3
3 X 1 = 3
3 X 2 = 6
3 X 3 = 9
3 X 4 = 12
3 X 5 = 15
3 X 6 = 18
3 X 7 = 21
3 X 8 = 24
3 X 9 = 27
3 X 10 = 30
Table 4
4 X 1 = 4
4 X 2 = 8
4 X 3 = 12
4 X 4 = 16
4 X 5 = 20
4 X 6 = 24
4 X 7 = 28
4 X 8 = 32
4 X 9 = 36
4 X 10 = 40
Table 5
5 X 1 = 5
5 X 2 = 10
5 X 3 = 15
5 X 4 = 20
5 X 5 = 25
5 X 6 = 30
5 X 7 = 35
5 X 8 = 40
5 X 9 = 45
5 X 10 = 50
Table 6
6 X 1 = 6
6 X 2 = 12
6 X 3 = 18
6 X 4 = 24
6 X 5 = 30
6 X 6 = 36
6 X 7 = 42
6 X 8 = 48
6 X 9 = 54
6 X 10 = 60
Table 7
7 X 1 = 7
7 X 2 = 14
7 X 3 = 21
7 X 4 = 28
7 X 5 = 35
7 X 6 = 42
7 X 7 = 49
7 X 8 = 56
7 X 9 = 63
7 X 10 = 70
Table 8
8 X 1 = 8
8 X 2 = 16
8 X 3 = 24
8 X 4 = 32
8 X 5 = 40
8 X 6 = 48
8 X 7 = 56
8 X 8 = 64
8 X 9 = 72
8 X 10 = 80
Table 9
9 X 1 = 9
9 X 2 = 18
9 X 3 = 27
9 X 4 = 36
9 X 5 = 45
9 X 6 = 54
9 X 7 = 63
9 X 8 = 72
9 X 9 = 81
9 X 10 = 90
Any number X 0 = 0
Any number X 1 = the same number
3 X 5 = 5 + 5 + 5
Or
3 X 5 = 3 + 3 + 3 + 3 + 3



Multiply by 2

GET READY to Learn

The students in an art class are working on an art project. They are told to work in 2 groups of 8. How many students are there in all?

MAIN IDEA

I will multiply by 2.

Standard 3NS2.2 Memorize to automaticity the multiplication table for numbers between 1 and 10.

There are many different ways to multiply by 2. One way is to draw a picture. Another way is to use an array.

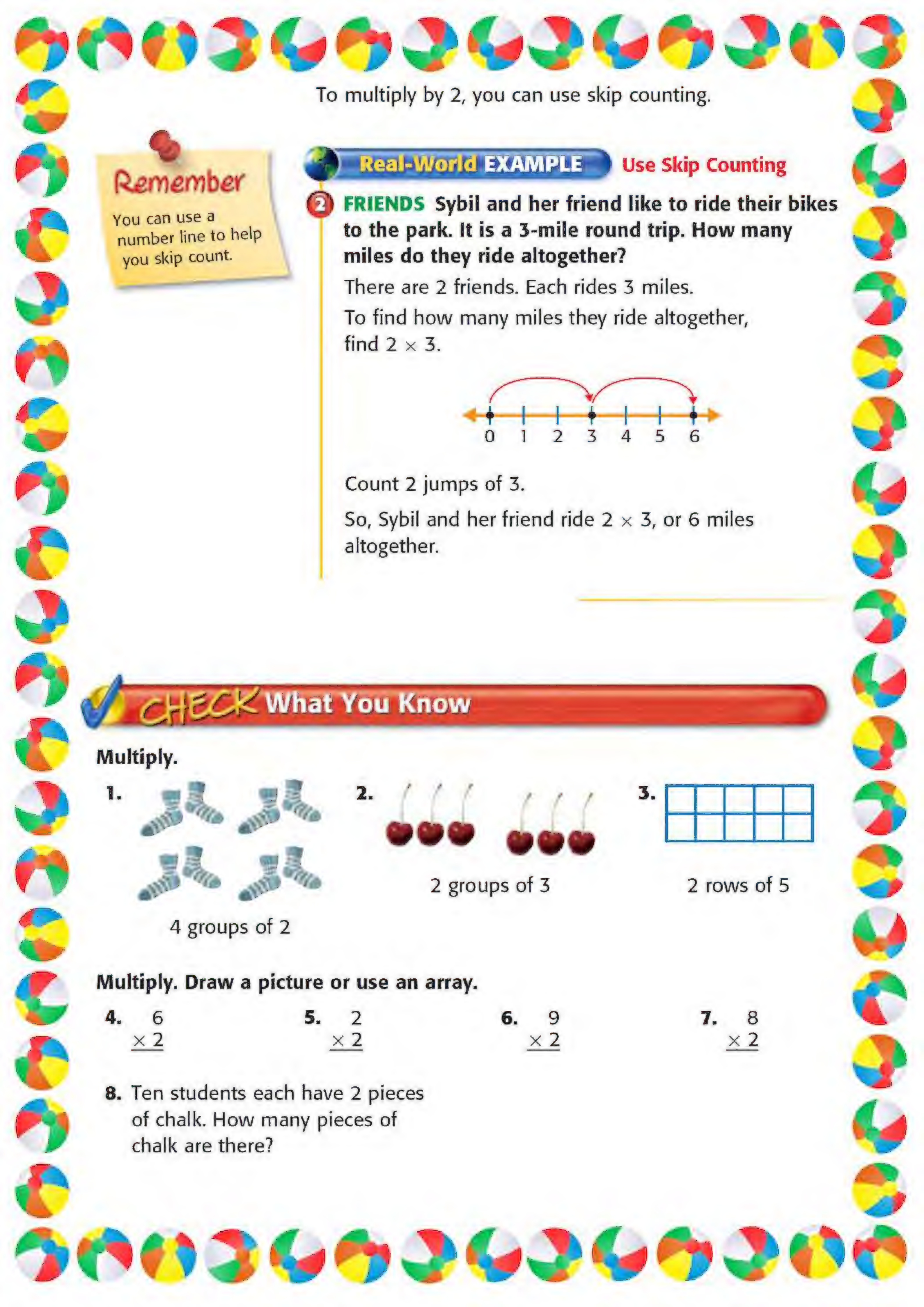
Real-World EXAMPLE — Multiply by 2

1 SCHOOL How many students are there in the art class if there are 2 groups of 8?

You need to find 2 groups of 8 or 2×8.

One Way: Draw a Picture	Another Way: Use an Array
Draw 2 groups of 8.	Show an array with 2 rows and 8 columns
X X X X X X X X X X X X X X X X	8 2 (array of 2 rows and 8 columns)
$8 + 8$ or 16	2 rows of $8 = 8 + 8$ or 16.

So, there are 2×8 or 16 students in all.



To multiply by 2, you can use skip counting.

Remember

You can use a number line to help you skip count.

Real-World EXAMPLE **Use Skip Counting**

2 **FRIENDS** **Sybil and her friend like to ride their bikes to the park. It is a 3-mile round trip. How many miles do they ride altogether?**

There are 2 friends. Each rides 3 miles.

To find how many miles they ride altogether, find 2×3.

Count 2 jumps of 3.

So, Sybil and her friend ride 2×3, or 6 miles altogether.

CHECK What You Know

Multiply.

1. 4 groups of 2

2. 2 groups of 3

3. 2 rows of 5

Multiply. Draw a picture or use an array.

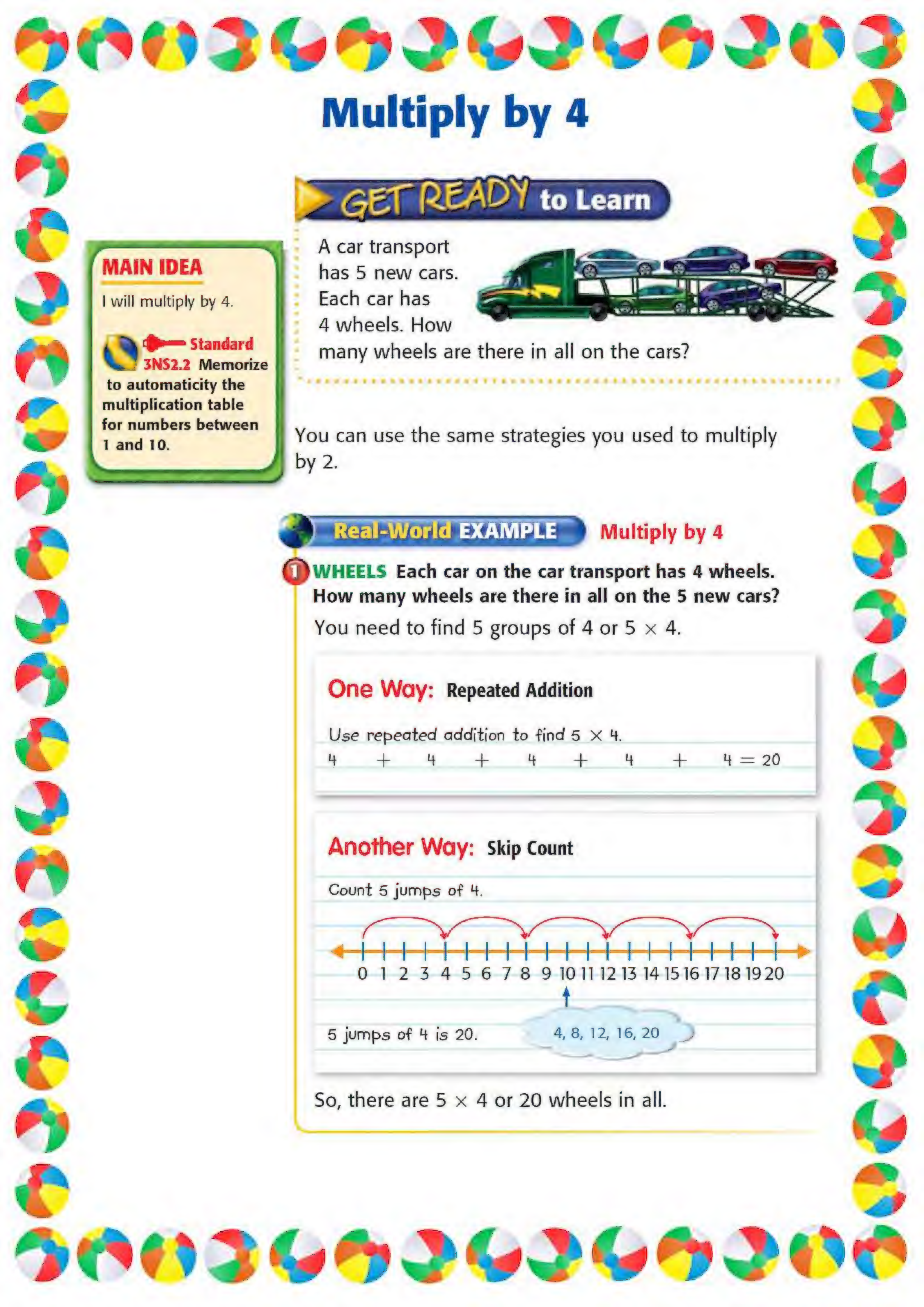
4. $\begin{array}{r} 6 \\ \times 2 \\ \hline \end{array}$

5. $\begin{array}{r} 2 \\ \times 2 \\ \hline \end{array}$

6. $\begin{array}{r} 9 \\ \times 2 \\ \hline \end{array}$

7. $\begin{array}{r} 8 \\ \times 2 \\ \hline \end{array}$

8. Ten students each have 2 pieces of chalk. How many pieces of chalk are there?



Multiply by 4

GET READY to Learn

A car transport has 5 new cars. Each car has 4 wheels. How many wheels are there in all on the cars?

MAIN IDEA

I will multiply by 4.

Standard 3NS2.2 Memorize to automaticity the multiplication table for numbers between 1 and 10.

You can use the same strategies you used to multiply by 2.

Real-World EXAMPLE Multiply by 4

1 **WHEELS** **Each car on the car transport has 4 wheels. How many wheels are there in all on the 5 new cars?**

You need to find 5 groups of 4 or 5 × 4.

One Way: Repeated Addition

Use repeated addition to find 5 × 4.

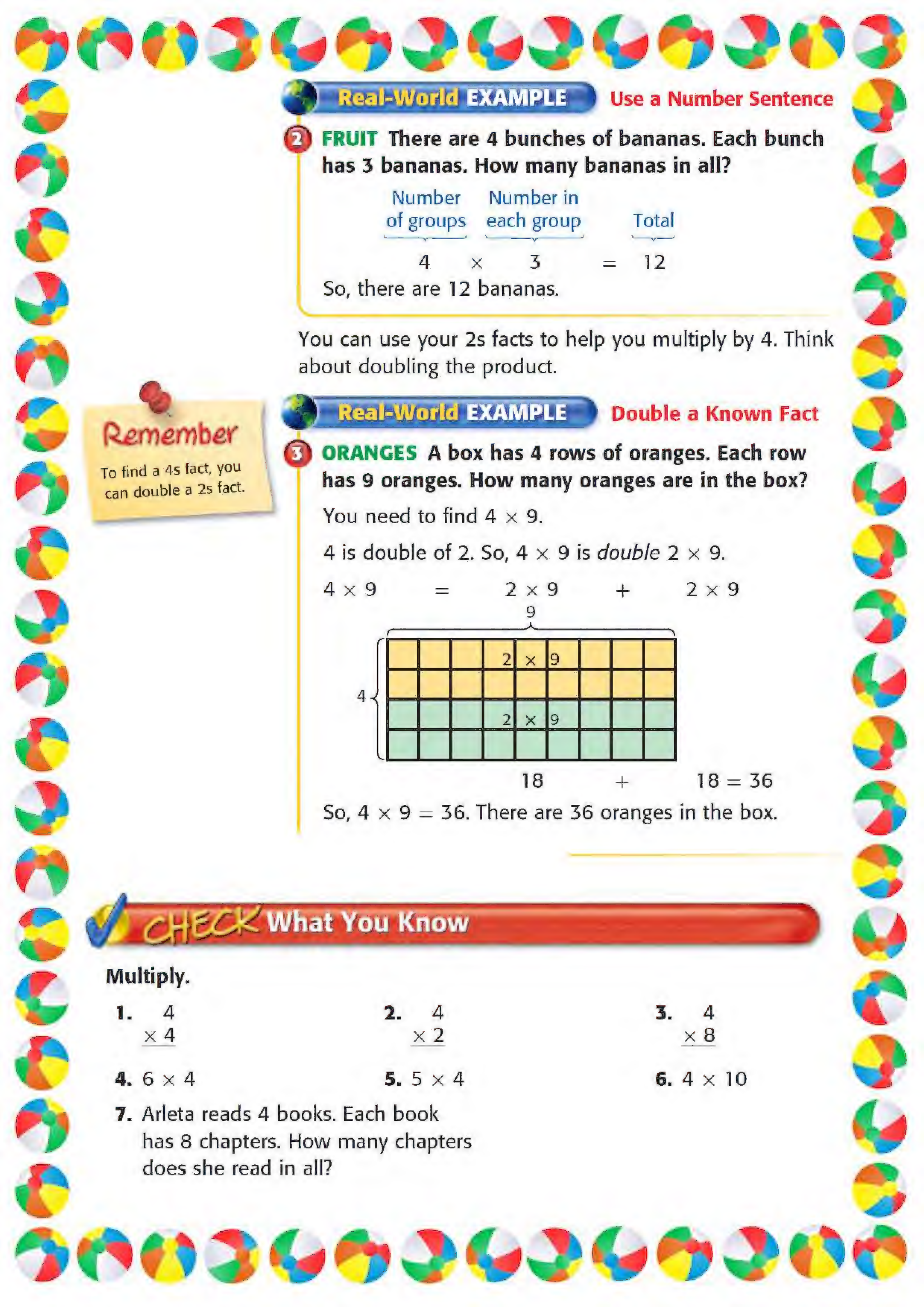
4 + 4 + 4 + 4 + 4 = 20

Another Way: Skip Count

Count 5 jumps of 4.

5 jumps of 4 is 20.

So, there are 5 × 4 or 20 wheels in all.



Real-World EXAMPLE Use a Number Sentence

2 **FRUIT** **There are 4 bunches of bananas. Each bunch has 3 bananas. How many bananas in all?**

Number of groups		Number in each group		Total
4	×	3	=	12

So, there are 12 bananas.

You can use your 2s facts to help you multiply by 4. Think about doubling the product.

Remember

To find a 4s fact, you can double a 2s fact.

Real-World EXAMPLE Double a Known Fact

3 **ORANGES** **A box has 4 rows of oranges. Each row has 9 oranges. How many oranges are in the box?**

You need to find 4×9.

4 is double of 2. So, 4×9 is *double* 2×9.

$4 \times 9 = 2 \times 9 + 2 \times 9$

$18 + 18 = 36$

So, $4 \times 9 = 36$. There are 36 oranges in the box.

CHECK What You Know

Multiply.

1. 4×4

2. 4×2

3. 4×8

4. 6×4

5. 5×4

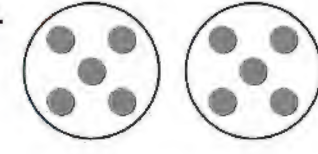
6. 4×10

7. Arleta reads 4 books. Each book has 8 chapters. How many chapters does she read in all?



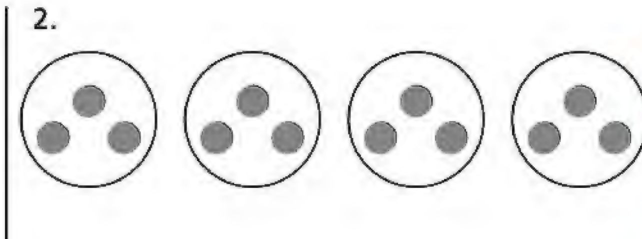
Multiply with 2 and 4

Write a multiplication sentence for the model.

1. 


Think: There are 2 groups of 5 counters.

2 × 5 = 10

2. 

___ × ___ = ___

Find the product.

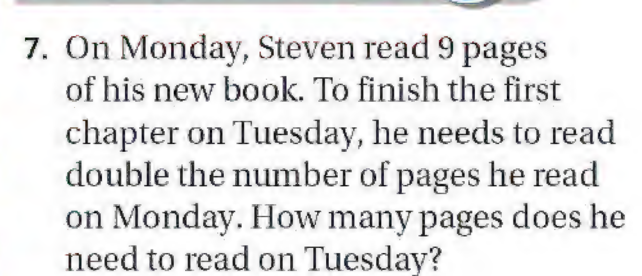
3. $\begin{array}{r} 2 \\ \times\ 6 \\ \hline \end{array}$

4. $\begin{array}{r} 4 \\ \times\ 8 \\ \hline \end{array}$

5. $\begin{array}{r} 2 \\ \times\ 3 \\ \hline \end{array}$

6. $\begin{array}{r} 4 \\ \times\ 6 \\ \hline \end{array}$

Problem Solving — Real World

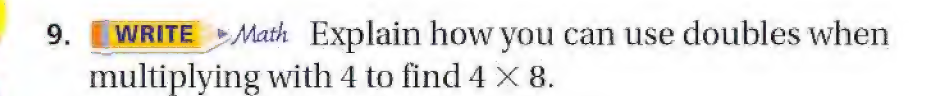


7. On Monday, Steven read 9 pages of his new book. To finish the first chapter on Tuesday, he needs to read double the number of pages he read on Monday. How many pages does he need to read on Tuesday?

____

8. Courtney's school is having a family game night. Each table has 4 players. There are 7 tables in all. How many players are at the game night?

____

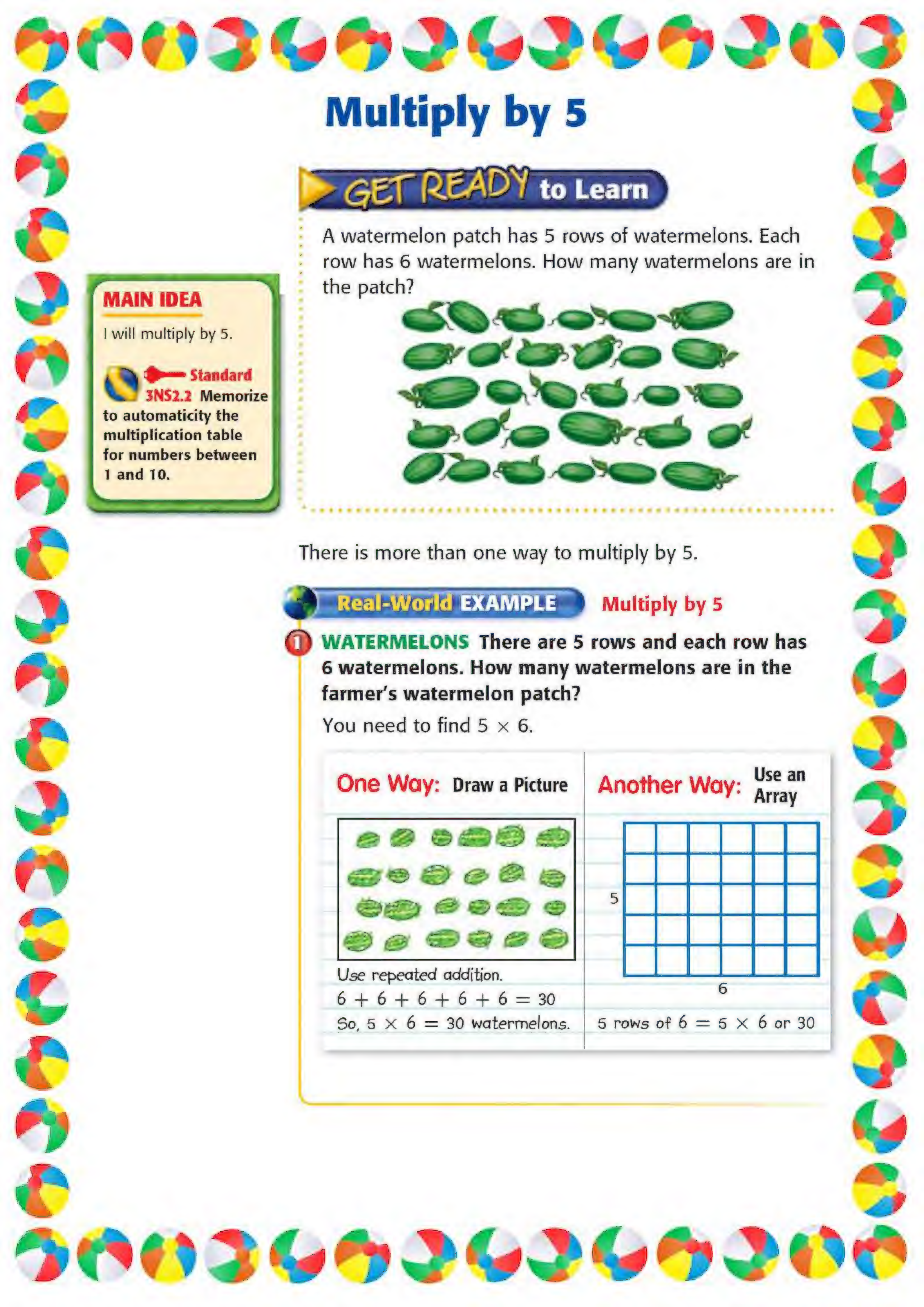


9. WRITE Math Explain how you can use doubles when multiplying with 4 to find 4 × 8.

____

____

Multiply by 5



GET READY to Learn

A watermelon patch has 5 rows of watermelons. Each row has 6 watermelons. How many watermelons are in the patch?

MAIN IDEA

I will multiply by 5.

Standard 3NS2.2 Memorize to automaticity the multiplication table for numbers between 1 and 10.

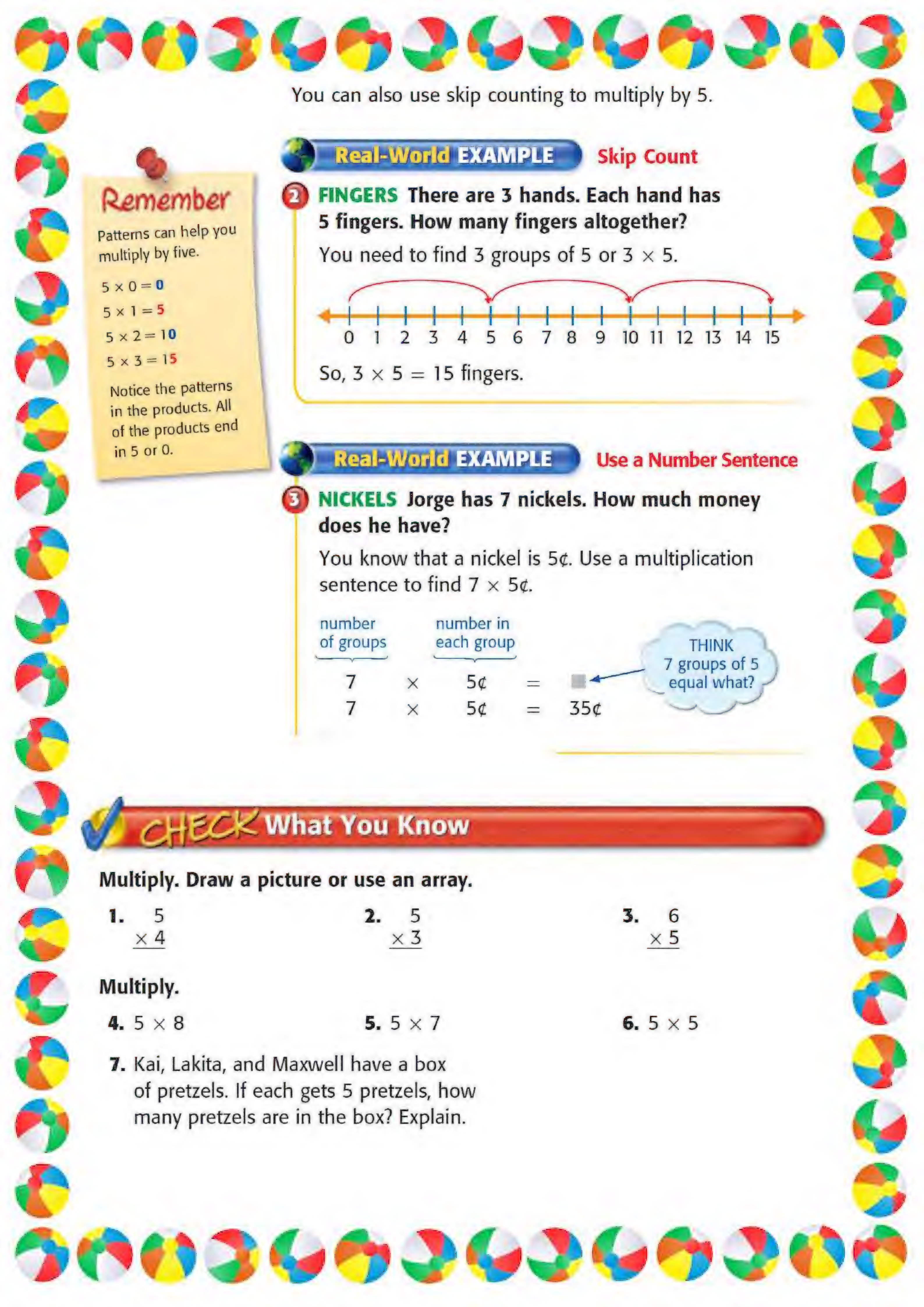
There is more than one way to multiply by 5.

Real-World EXAMPLE — Multiply by 5

1. **WATERMELONS There are 5 rows and each row has 6 watermelons. How many watermelons are in the farmer's watermelon patch?**

You need to find 5×6.

One Way: Draw a Picture	Another Way: Use an Array
Use repeated addition. $6 + 6 + 6 + 6 + 6 = 30$ So, $5 \times 6 = 30$ watermelons.	5 rows of $6 = 5 \times 6$ or 30



You can also use skip counting to multiply by 5.

Remember

Patterns can help you multiply by five.

$5 \times 0 = 0$
$5 \times 1 = 5$
$5 \times 2 = 10$
$5 \times 3 = 15$

Notice the patterns in the products. All of the products end in 5 or 0.

Real-World EXAMPLE — Skip Count

2 **FINGERS There are 3 hands. Each hand has 5 fingers. How many fingers altogether?**

You need to find 3 groups of 5 or 3×5.

So, $3 \times 5 = 15$ fingers.

Real-World EXAMPLE — Use a Number Sentence

3 **NICKELS Jorge has 7 nickels. How much money does he have?**

You know that a nickel is 5¢. Use a multiplication sentence to find $7 \times 5¢$.

number of groups — number in each group

$7 \times 5¢ = \blacksquare$

$7 \times 5¢ = 35¢$

THINK 7 groups of 5 equal what?

CHECK What You Know

Multiply. Draw a picture or use an array.

1. 5×4

2. 5×3

3. 6×5

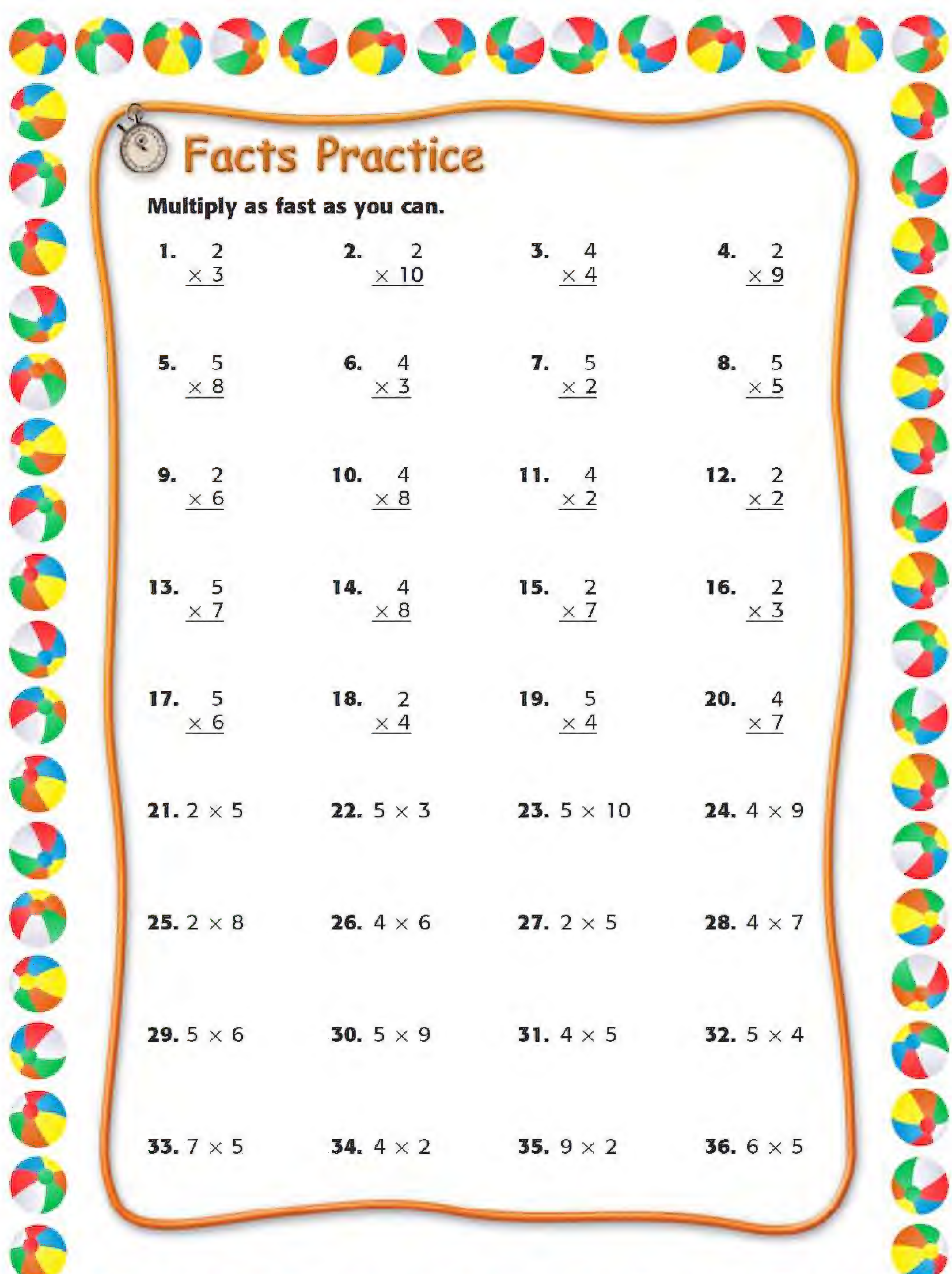
Multiply.

4. 5×8

5. 5×7

6. 5×5

7. Kai, Lakita, and Maxwell have a box of pretzels. If each gets 5 pretzels, how many pretzels are in the box? Explain.



Facts Practice

Multiply as fast as you can.

1. 2×3

2. 2×10

3. 4×4

4. 2×9

5. 5×8

6. 4×3

7. 5×2

8. 5×5

9. 2×6

10. 4×8

11. 4×2

12. 2×2

13. 5×7

14. 4×8

15. 2×7

16. 2×3

17. 5×6

18. 2×4

19. 5×4

20. 4×7

21. 2×5

22. 5×3

23. 5×10

24. 4×9

25. 2×8

26. 4×6

27. 2×5

28. 4×7

29. 5×6

30. 5×9

31. 4×5

32. 5×4

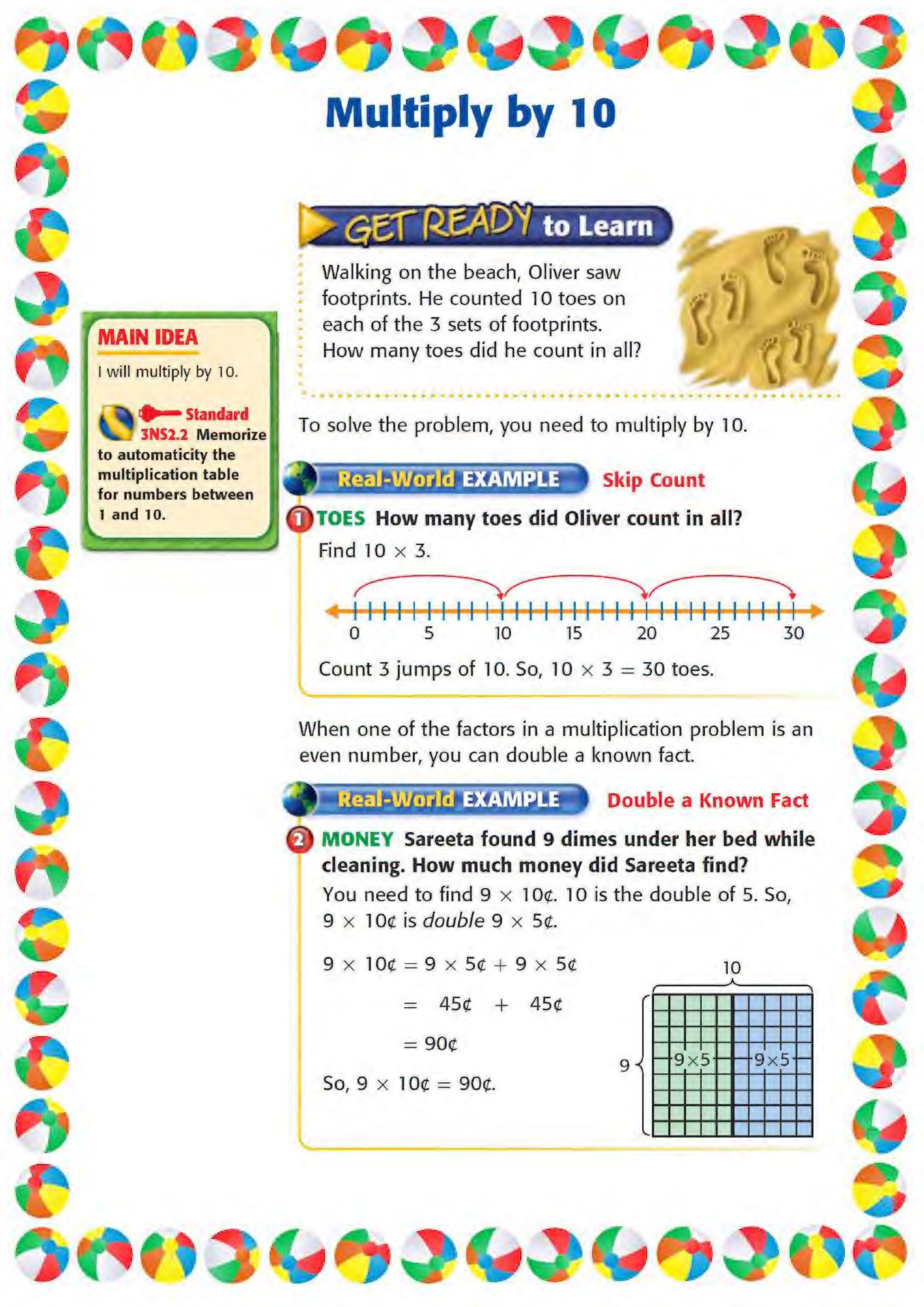
33. 7×5

34. 4×2

35. 9×2

36. 6×5

Multiply by 10



MAIN IDEA

I will multiply by 10.

Standard 3NS2.2 Memorize to automaticity the multiplication table for numbers between 1 and 10.

GET READY to Learn

Walking on the beach, Oliver saw footprints. He counted 10 toes on each of the 3 sets of footprints. How many toes did he count in all?

To solve the problem, you need to multiply by 10.

Real-World EXAMPLE — Skip Count

1 TOES How many toes did Oliver count in all?

Find 10×3.

Count 3 jumps of 10. So, $10 \times 3 = 30$ toes.

When one of the factors in a multiplication problem is an even number, you can double a known fact.

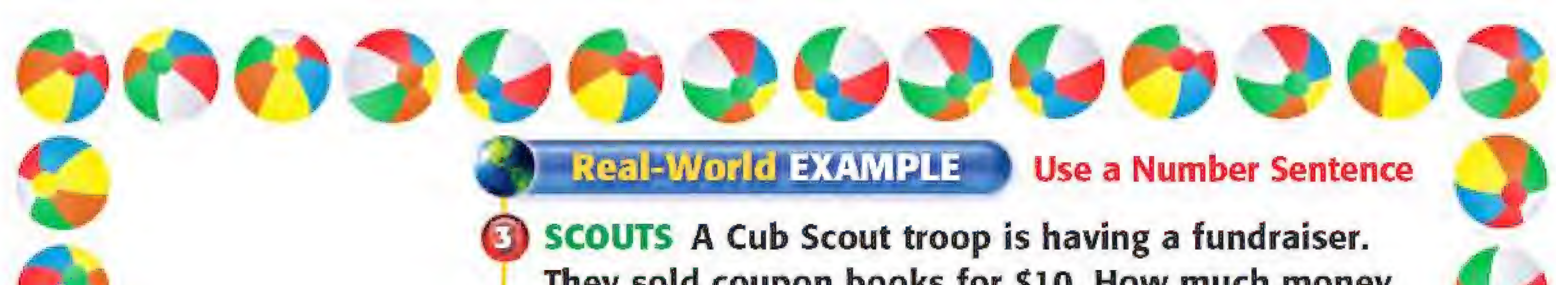
Real-World EXAMPLE — Double a Known Fact

2 MONEY Sareeta found 9 dimes under her bed while cleaning. How much money did Sareeta find?

You need to find $9 \times 10¢$. 10 is the double of 5. So, $9 \times 10¢$ is *double* $9 \times 5¢$.

$$9 \times 10¢ = 9 \times 5¢ + 9 \times 5¢$$
$$= 45¢ + 45¢$$
$$= 90¢$$

So, $9 \times 10¢ = 90¢$.



Real-World EXAMPLE — Use a Number Sentence

3 SCOUTS A Cub Scout troop is having a fundraiser. They sold coupon books for $10. How much money did Javier raise?

Name	Money Raised							Total
Jared	✪	✪	✪	✪	✪	✪	✪	$70
Bartolo	✪	✪	✪	✪				$40
Javier	✪	✪	✪	✪	✪	✪		■

Key ✪ = $10

To solve the problem, you need to multiply 6 by $10.

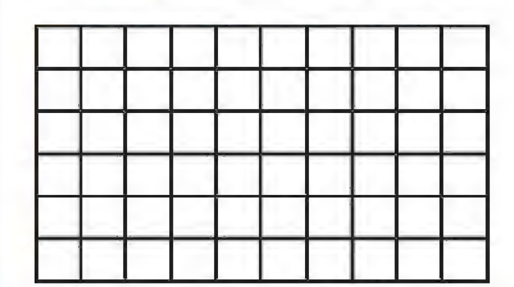
$6 \times \$10 = ■$ ← THINK How much is six $10 bills?

$6 \times \$10 = \$60$

So, Javier raised $60.

Check

The model shows that $6 \times 10 = 60$.



Remember

Patterns can help you multiply by 10.

$10 \times 1 = 10$
$10 \times 2 = 20$
$10 \times 3 = 30$
$10 \times 4 = 40$
$10 \times 5 = 50$

CHECK What You Know

Multiply.

1. 10×2

2. 10×4

3. 10×7

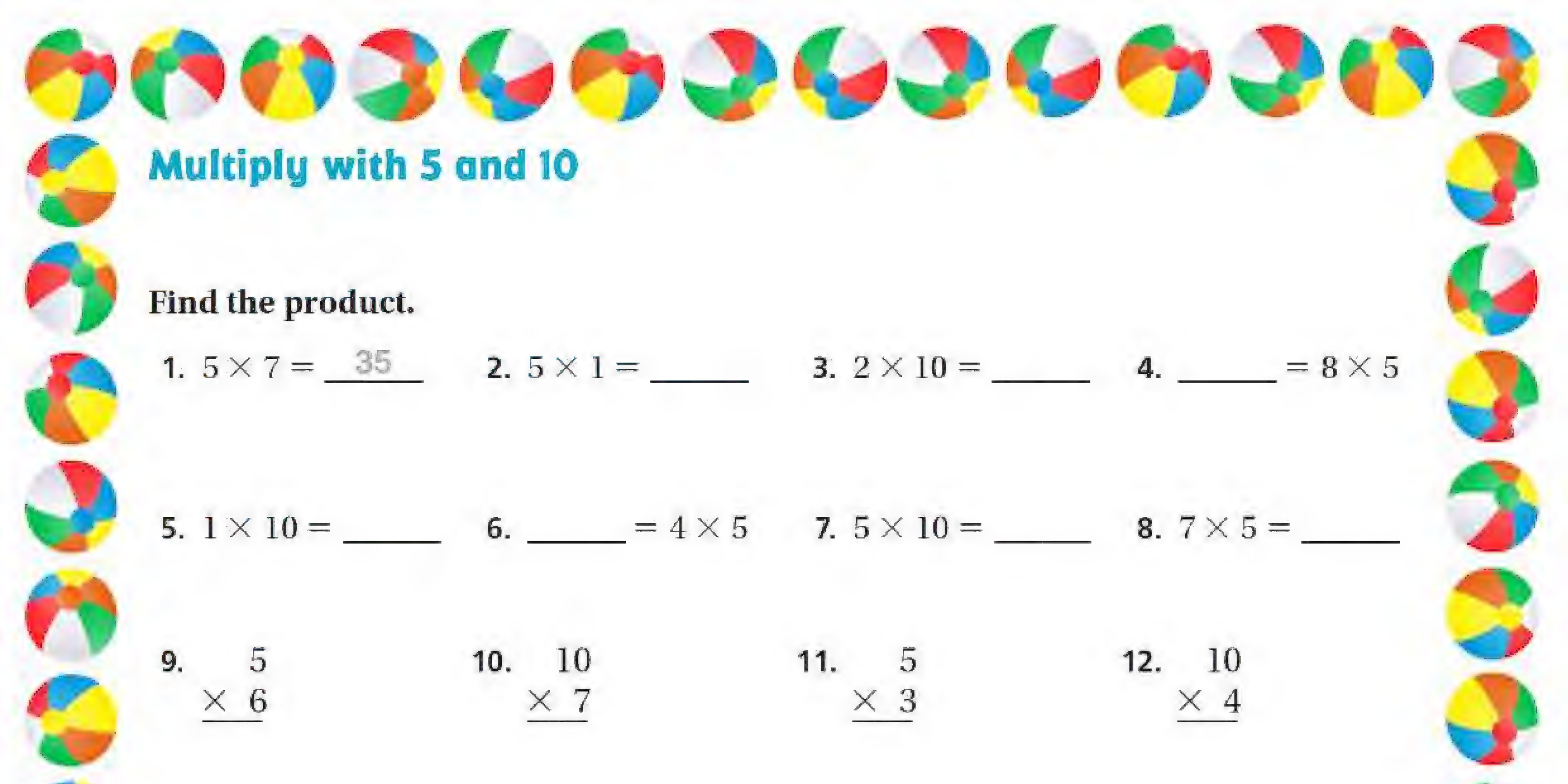
4. 5×10

5. 3×10

6. 10×10

7. Mina bought a dress for $50. How many $10 bills will she need to pay for the dress?

8.



Multiply with 5 and 10

Find the product.

1. $5 \times 7 =$ 35
2. $5 \times 1 =$ ______
3. $2 \times 10 =$ ______
4. ______ $= 8 \times 5$
5. $1 \times 10 =$ ______
6. ______ $= 4 \times 5$
7. $5 \times 10 =$ ______
8. $7 \times 5 =$ ______
9. 5×6
10. 10×7
11. 5×3
12. 10×4
13. 5×0
14. 10×8
15. 5×2
16. 10×6

Problem Solving Real World

17. Ginger takes 10 nickels to buy some pencils at the school store. How many cents does Ginger have to spend?

______

18. The gym at Evergreen School has three basketball courts. There are 5 players on each of the courts. How many players are there?

______

19. WRITE Math Michelle bought some pinwheels for a dollar and paid in dimes. How many dimes did she use? Explain.

______

______



Multiply by 0 and 1

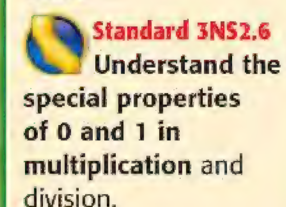


GET READY to Learn

There are 4 daisies in 1 flower pot.
How many daisies are there in all?

MAIN IDEA

I will multiply by 0 and 1.



Standard 3NS2.6 **Understand the special properties of 0 and 1 in multiplication** and division.

New Vocabulary

Zero Property of Multiplication

Identity Property of Multiplication

There are special properties for multiplying by 1 and 0.

KEY CONCEPT — **Multiplication Properties**

Words The **Identity Property of Multiplication** says that when any number is multiplied by 1, the product is that number.

Example $1 \times 4 = 4$ — One group of 4 is 4.

Words The **Zero Property of Multiplication** says that when you multiply a number by 0, the product is zero.

Examples $3 \times 0 = 0$ — Three groups of 0 are 0.

CHECK What You Know

Multiply.

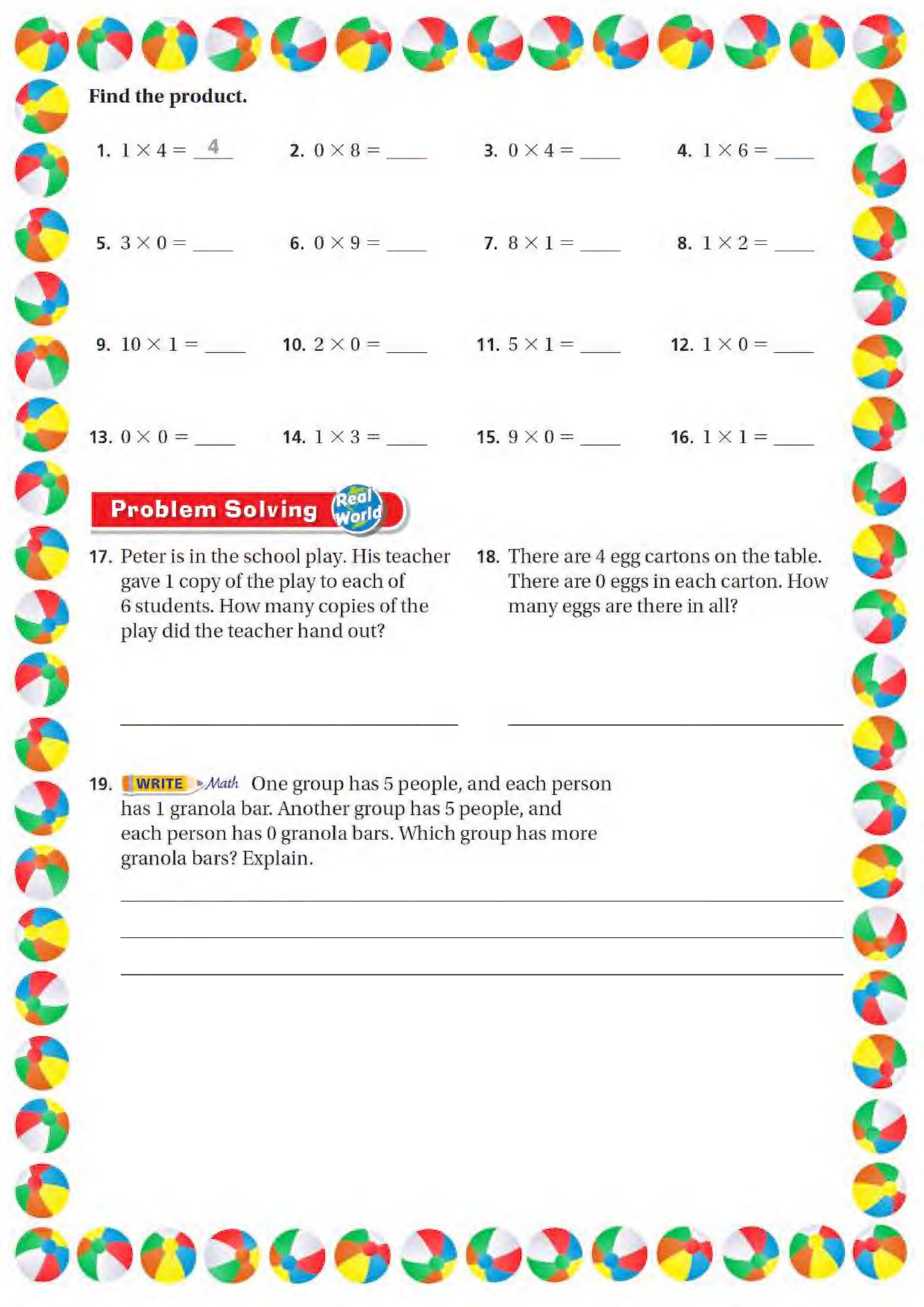
1. 6×0

2. 1×7

3. 5×0

4. 8×1

5. There is 1 student sitting at each of the 9 tables in the cafeteria. How many students are there altogether?



Find the product.

1. $1 \times 4 =$ 4
2. $0 \times 8 =$ ____
3. $0 \times 4 =$ ____
4. $1 \times 6 =$ ____
5. $3 \times 0 =$ ____
6. $0 \times 9 =$ ____
7. $8 \times 1 =$ ____
8. $1 \times 2 =$ ____
9. $10 \times 1 =$ ____
10. $2 \times 0 =$ ____
11. $5 \times 1 =$ ____
12. $1 \times 0 =$ ____
13. $0 \times 0 =$ ____
14. $1 \times 3 =$ ____
15. $9 \times 0 =$ ____
16. $1 \times 1 =$ ____

Problem Solving Real World

17. Peter is in the school play. His teacher gave 1 copy of the play to each of 6 students. How many copies of the play did the teacher hand out?

____

18. There are 4 egg cartons on the table. There are 0 eggs in each carton. How many eggs are there in all?

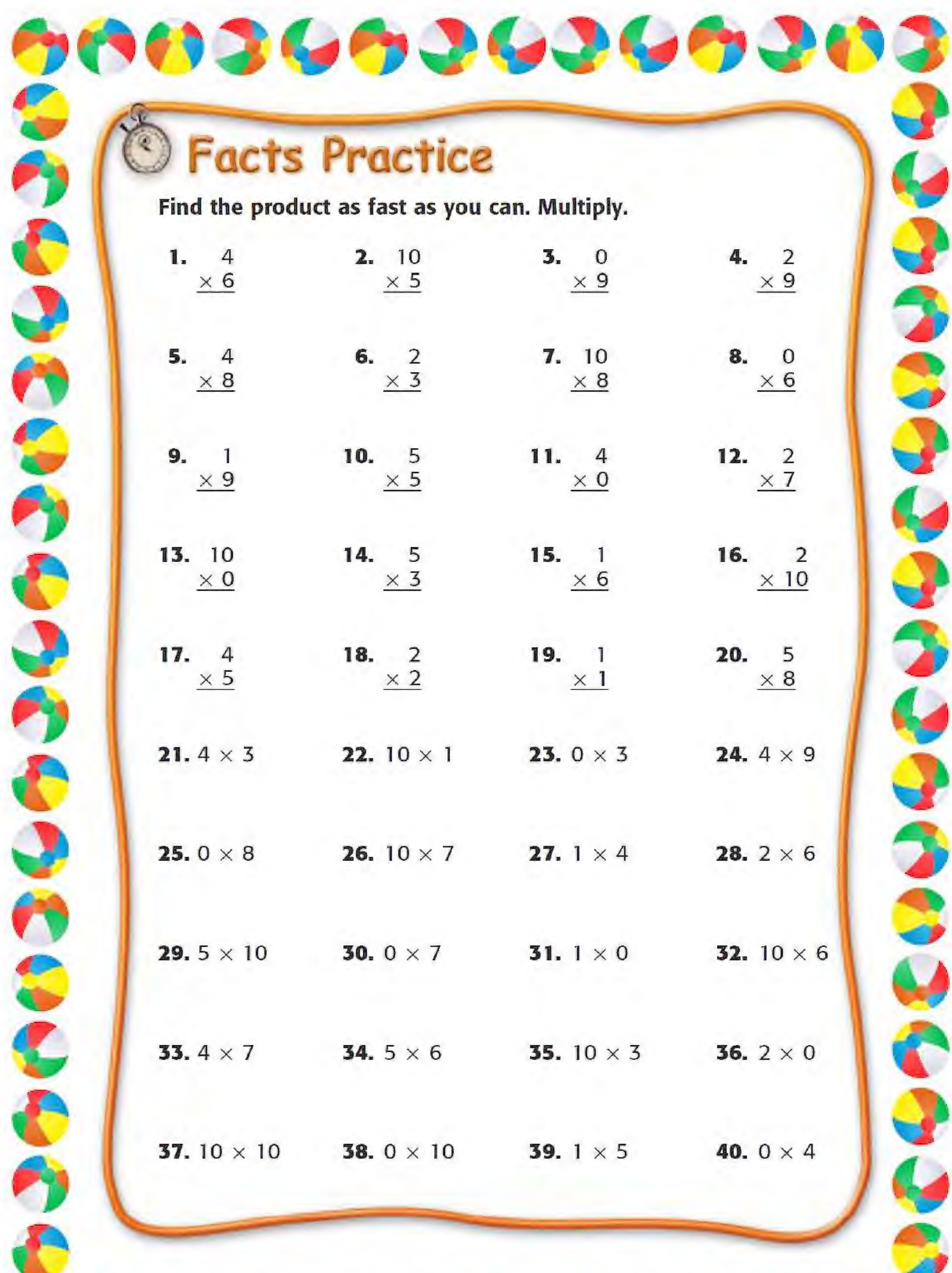
____

19. WRITE Math One group has 5 people, and each person has 1 granola bar. Another group has 5 people, and each person has 0 granola bars. Which group has more granola bars? Explain.

____

____

____



Facts Practice

Find the product as fast as you can. Multiply.

1. 4×6	**2.** 10×5	**3.** 0×9	**4.** 2×9
5. 4×8	**6.** 2×3	**7.** 10×8	**8.** 0×6
9. 1×9	**10.** 5×5	**11.** 4×0	**12.** 2×7
13. 10×0	**14.** 5×3	**15.** 1×6	**16.** 2×10
17. 4×5	**18.** 2×2	**19.** 1×1	**20.** 5×8
21. 4×3	**22.** 10×1	**23.** 0×3	**24.** 4×9
25. 0×8	**26.** 10×7	**27.** 1×4	**28.** 2×6
29. 5×10	**30.** 0×7	**31.** 1×0	**32.** 10×6
33. 4×7	**34.** 5×6	**35.** 10×3	**36.** 2×0
37. 10×10	**38.** 0×10	**39.** 1×5	**40.** 0×4

Multiply by 3

MAIN IDEA

I will multiply by 3.

Standard 3NS2.2 **Memorize to automaticity the multiplication table for numbers between 1 and 10.**

Standard 3MR2.3 **Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, and models, to explain mathematical reasoning.**

GET READY to Learn

In the previous activity, you explored the multiplication table.

×	0	1	2	3	4	5	6	7	8	9	10
0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	10
2	0	2	4	6	8	10	12	14	16	18	20
3	0	3	6	9	12	15	18	21	24	27	30
4	0	4	8	12	16	20	24	28	32	36	40
5	0	5	10	15	20	25	30	35	40	45	50
6	0	6	12	18	24	30	36	42	48	54	60
7	0	7	14	21	28	35	42	49	56	63	70
8	0	8	16	24	32	40	48	56	64	72	80
9	0	9	18	27	36	45	54	63	72	81	90
10	0	10	20	30	40	50	60	70	80	90	100

There are different ways you can find products.

Real-World EXAMPLE — Use an Array

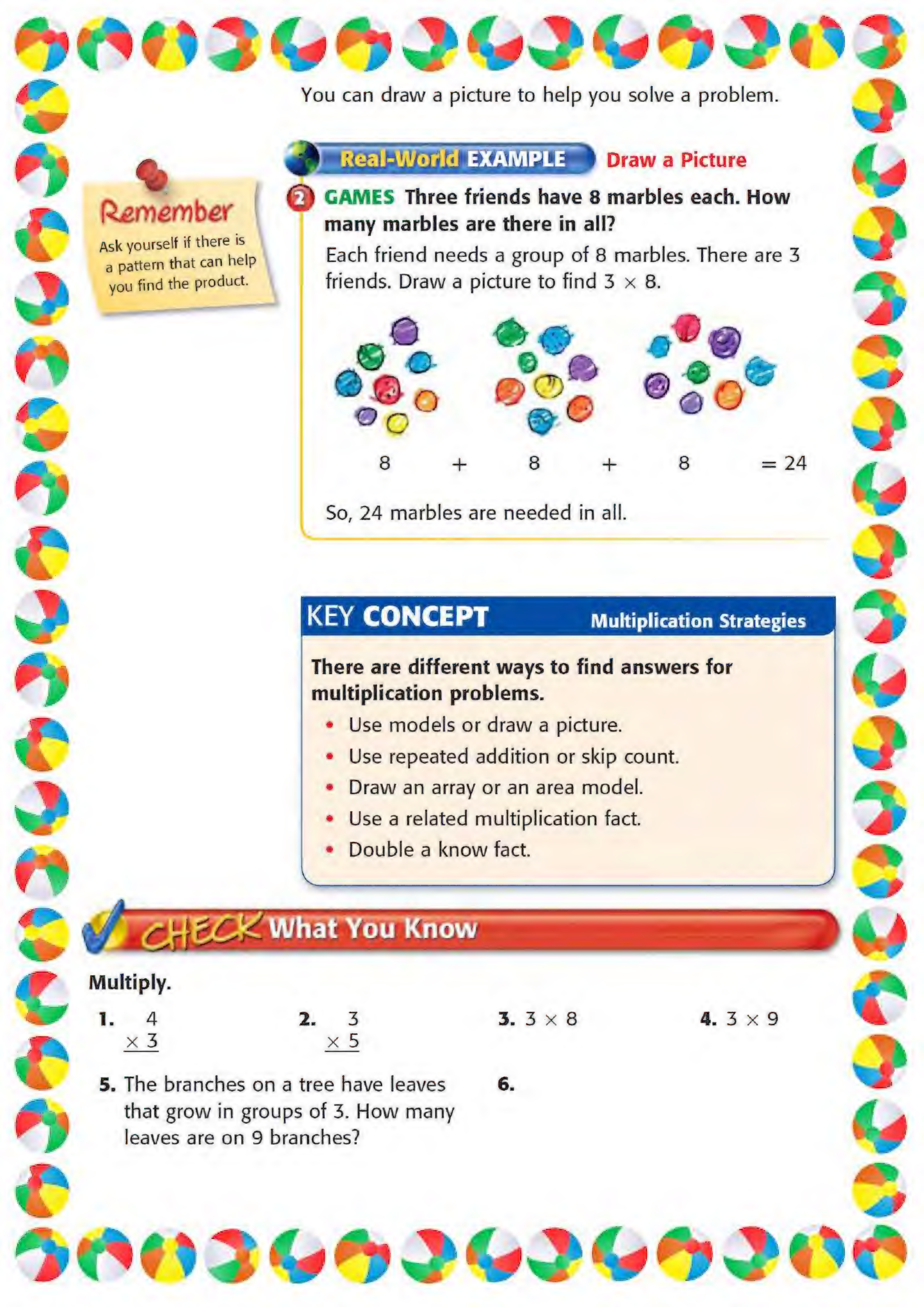
1 **PETS** **There are 3 dogs. Each dog buried 4 bones in a yard. How many bones are buried in the yard?**

You can use an array to find 3 groups of 4 bones or 3×4.



So, there are 12 bones buried in the yard.





You can draw a picture to help you solve a problem.

Remember
Ask yourself if there is a pattern that can help you find the product.

Real-World EXAMPLE Draw a Picture

2 **GAMES Three friends have 8 marbles each. How many marbles are there in all?**

Each friend needs a group of 8 marbles. There are 3 friends. Draw a picture to find 3×8.

8 + 8 + 8 = 24

So, 24 marbles are needed in all.

KEY CONCEPT Multiplication Strategies

There are different ways to find answers for multiplication problems.

- Use models or draw a picture.
- Use repeated addition or skip count.
- Draw an array or an area model.
- Use a related multiplication fact.
- Double a know fact.

CHECK What You Know

Multiply.

1. 4×3

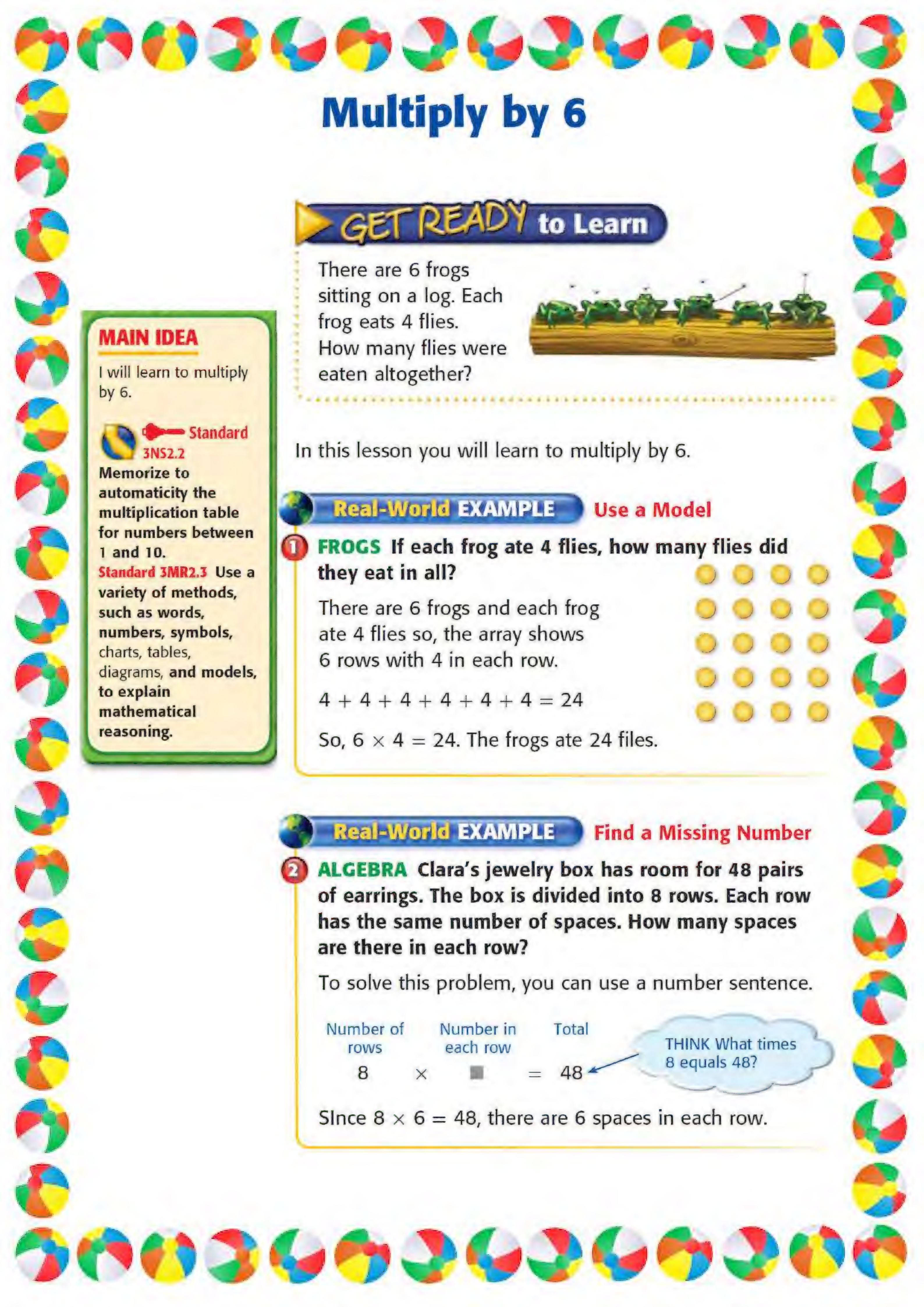
2. 3×5

3. 3×8

4. 3×9

5. The branches on a tree have leaves that grow in groups of 3. How many leaves are on 9 branches?

6.



Multiply by 6

GET READY to Learn

There are 6 frogs sitting on a log. Each frog eats 4 flies. How many flies were eaten altogether?

MAIN IDEA

I will learn to multiply by 6.

Standard 3NS2.2 **Memorize to automaticity the multiplication table for numbers between 1 and 10.**

Standard 3MR2.3 **Use a variety of methods, such as words, numbers, symbols,** charts, tables, diagrams, **and models, to explain mathematical reasoning.**

In this lesson you will learn to multiply by 6.

Real-World EXAMPLE — Use a Model

1 **FROGS** **If each frog ate 4 flies, how many flies did they eat in all?**

There are 6 frogs and each frog ate 4 flies so, the array shows 6 rows with 4 in each row.

$4 + 4 + 4 + 4 + 4 + 4 = 24$

So, $6 \times 4 = 24$. The frogs ate 24 files.

Real-World EXAMPLE — Find a Missing Number

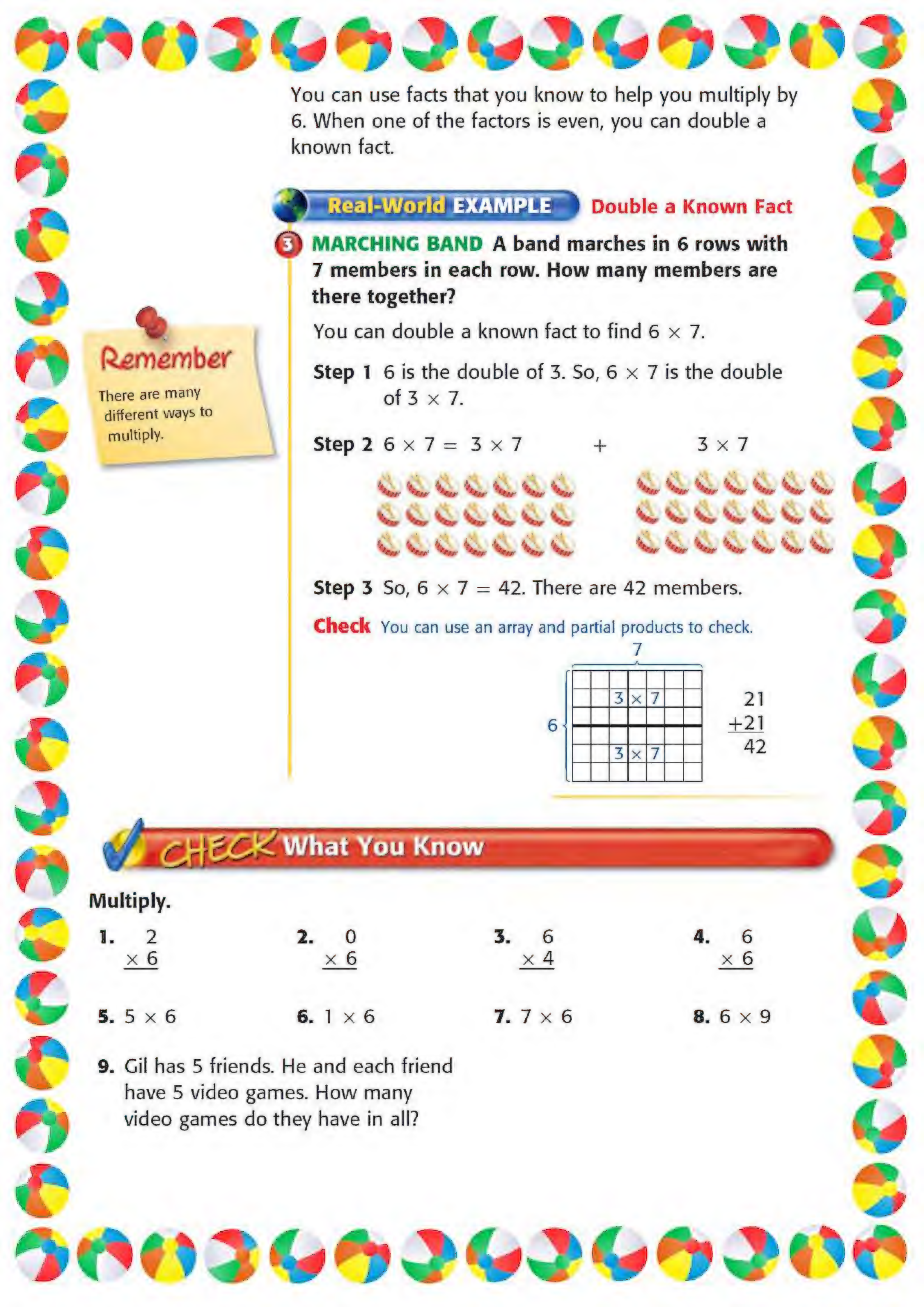
2 **ALGEBRA** **Clara's jewelry box has room for 48 pairs of earrings. The box is divided into 8 rows. Each row has the same number of spaces. How many spaces are there in each row?**

To solve this problem, you can use a number sentence.

Number of rows		Number in each row		Total
8	×	■	=	48

THINK What times 8 equals 48?

SInce $8 \times 6 = 48$, there are 6 spaces in each row.



You can use facts that you know to help you multiply by 6. When one of the factors is even, you can double a known fact.

Real-World EXAMPLE **Double a Known Fact**

3 **MARCHING BAND** **A band marches in 6 rows with 7 members in each row. How many members are there together?**

You can double a known fact to find 6 × 7.

Step 1 6 is the double of 3. So, 6 × 7 is the double of 3 × 7.

Step 2 6 × 7 = 3 × 7 + 3 × 7

Step 3 So, 6 × 7 = 42. There are 42 members.

Check You can use an array and partial products to check.

  21
+21
  42

Remember

There are many different ways to multiply.

CHECK What You Know

Multiply.

1. 2 × 6

2. 0 × 6

3. 6 × 4

4. 6 × 6

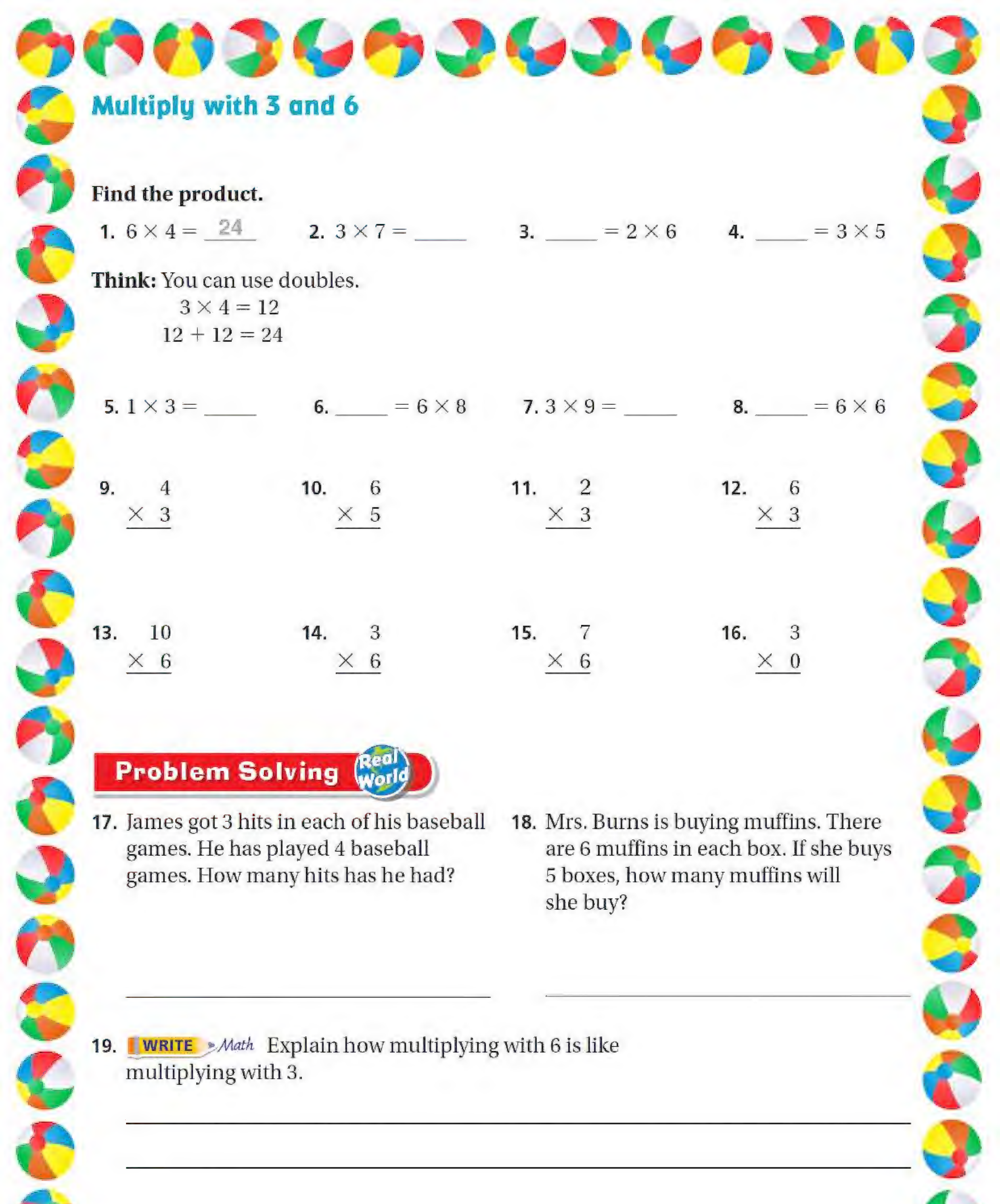
5. 5 × 6

6. 1 × 6

7. 7 × 6

8. 6 × 9

9. Gil has 5 friends. He and each friend have 5 video games. How many video games do they have in all?



Multiply with 3 and 6

Find the product.

1. $6 \times 4 =$ 24
2. $3 \times 7 =$ ______
3. ______ $= 2 \times 6$
4. ______ $= 3 \times 5$

Think: You can use doubles.

$3 \times 4 = 12$

$12 + 12 = 24$

5. $1 \times 3 =$ ______
6. ______ $= 6 \times 8$
7. $3 \times 9 =$ ______
8. ______ $= 6 \times 6$

9. 4×3
10. 6×5
11. 2×3
12. 6×3

13. 10×6
14. 3×6
15. 7×6
16. 3×0

Problem Solving Real World

17. James got 3 hits in each of his baseball games. He has played 4 baseball games. How many hits has he had?

______

18. Mrs. Burns is buying muffins. There are 6 muffins in each box. If she buys 5 boxes, how many muffins will she buy?

______

19. WRITE Math Explain how multiplying with 6 is like multiplying with 3.

______

______

Facts Practice

Multiply.

1. 4×9

2. 5×3

3. 6×4

4. 3×6

5. 3×2

6. 4×4

7. 2×2

8. 4×5

9. 4×6

10. 2×5

11. 2×7

12. 8×2

13. 8×3

14. 2×3

15. 6×3

16. 4×3

17. 6×5

18. 3×9

19. 6×2

20. 4×7

21. 7×2

22. 5×2

23. 6×6

24. 2×4

25. 6×7

26. 3×3

27. 5×6

28. 7×4

29. 3×4

30. 4×4

31. 7×3

32. 9×2

33. 5×5

34. 9×4

35. 2×6

36. 5×7

Multiply by 7

GET READY to Learn

A ride at an amusement park has 7 cars. Each car has 5 seats. How many people can go on the ride at the same time?

MAIN IDEA

I will learn to multiply by 7.

Standard 3NS2.2 **Memorize to automaticity the multiplication table for numbers between 1 and 10.**

Standard 3MR2.3 **Use a variety of methods, such as words, numbers, symbols,** charts, graphs, tables, **diagrams, and models, to explain mathematical reasoning.**

You can use repeated addition to multiply by 7.

Real-World EXAMPLE — Use Repeated Addition

1 RIDES If there are 7 cars with 5 seats in each car, how many can ride at the same time?

Find 7×5. Use repeated addition to count the 7 groups of 5 seats in each car. Add 5 seven times.

$5 + 5 + 5 + 5 + 5 + 5 + 5 = 35$

So, $7 \times 5 = 35$ people can ride at the same time.

To multiply by 7, you can also use a known fact.

Remember

The Commutative Property says that the product does not change if the order of the factors changes.

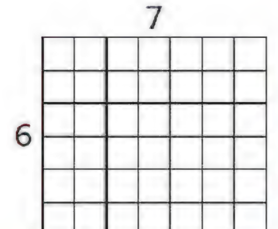
EXAMPLE — Use a Known Fact

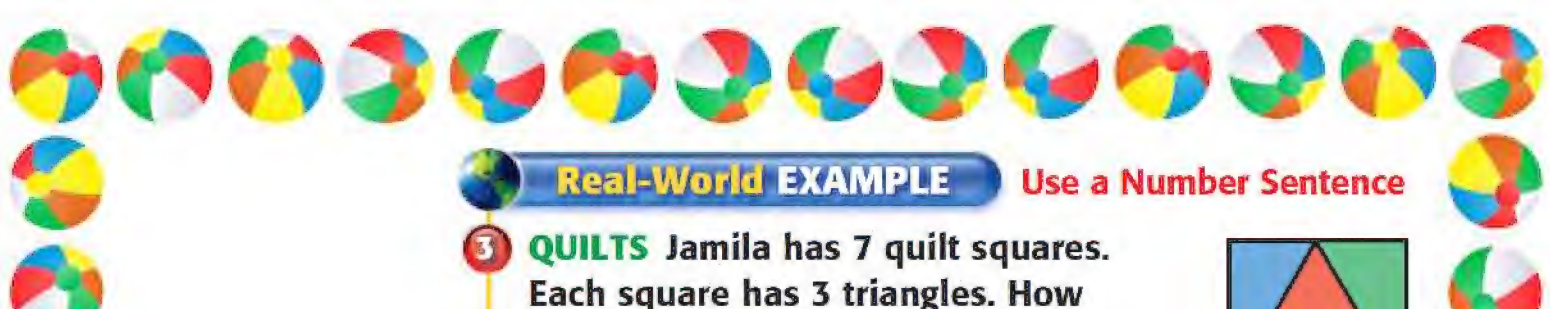


2 Find 7×6.

You know $6 \times 7 = 42$.

So, $7 \times 6 = 42$. Commutative Property





Real-World EXAMPLE — **Use a Number Sentence**

3 **QUILTS** **Jamila has 7 quilt squares. Each square has 3 triangles. How many triangles are there in all?**

There are 3 triangles on each quilt square.
To find the number of triangles in all, multiply 7 and 3.

$7 \times 3 = ■$ 7 groups of 3 equals what?

$7 \times 3 = 21$

So, there are 21 triangles in all.

Real-World EXAMPLE — **Find Missing Numbers**

4 **ALGEBRA** **A bug box has a total of 28 beetles. There are 7 different sizes of beetles. If there is an equal number of each size, how many of each size are there?**

To solve the problem, you can use a number sentence.



Different Sizes		Number of each size		Total
7	×	■	=	28 What times 7 equals 28?

The missing number is 4.

Since $7 \times 4 = 28$, there are 4 beetles of each size.

CHECK What You Know

Multiply.

1. 2×7 **2.** 7×8 **3.** 9×7 **4.** 7×10

Algebra **Find each missing number.**

5. $7 \times ■ = 0$ **6.** $■ \times 7 = 49$ **7.** $7 \times ■ = 70$

8. Brianna gave 7 friends 4 pencils each. How many pencils did she give them in all?



Multiply with 7

Find the product.

1. $6 \times 7 =$ 42 **2.** _____ $= 7 \times 9$ **3.** _____ $= 1 \times 7$ **4.** $3 \times 7 =$ _____

5. $7 \times 7 =$ _____ **6.** _____ $= 2 \times 7$ **7.** $7 \times 8 =$ _____ **8.** _____ $= 4 \times 7$

9. $\begin{array}{r} 7 \\ \times\ 5 \\ \hline \end{array}$ **10.** $\begin{array}{r} 7 \\ \times\ 1 \\ \hline \end{array}$ **11.** $\begin{array}{r} 6 \\ \times\ 7 \\ \hline \end{array}$ **12.** $\begin{array}{r} 7 \\ \times\ 4 \\ \hline \end{array}$ **13.** $\begin{array}{r} 2 \\ \times\ 7 \\ \hline \end{array}$

14. $\begin{array}{r} 10 \\ \times\ 7 \\ \hline \end{array}$ **15.** $\begin{array}{r} 3 \\ \times\ 7 \\ \hline \end{array}$ **16.** $\begin{array}{r} 7 \\ \times\ 9 \\ \hline \end{array}$ **17.** $\begin{array}{r} 8 \\ \times\ 7 \\ \hline \end{array}$ **18.** $\begin{array}{r} 7 \\ \times\ 0 \\ \hline \end{array}$

Problem Solving



19. Julie buys a pair of earrings for $7. Now she would like to buy the same earrings for 2 of her friends. How much will she spend for all 3 pairs of earrings?

____

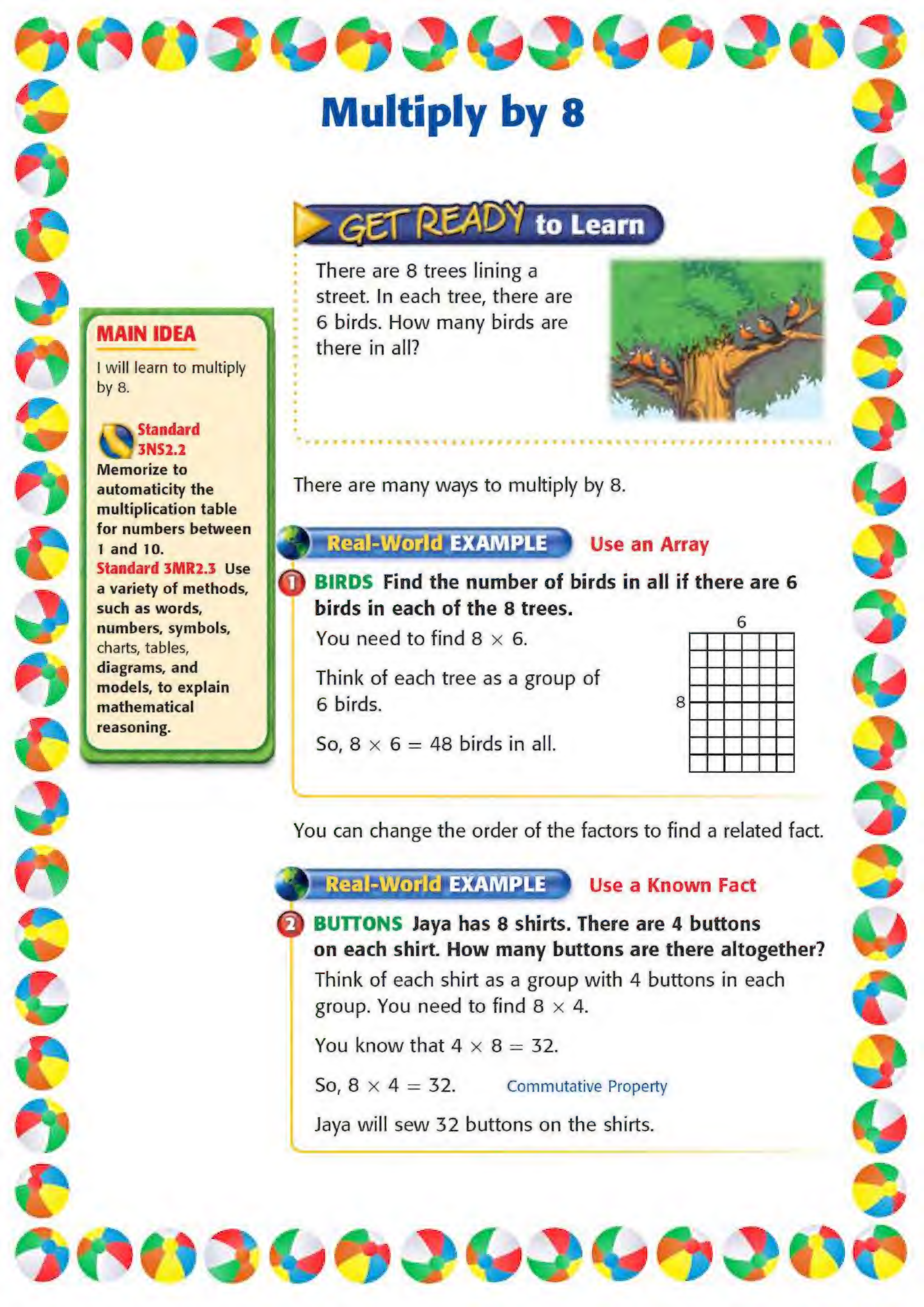
20. Owen and his family will go camping in 8 weeks. There are 7 days in 1 week. How many days are in 8 weeks?

____

21. **WRITE** *Math* Explain how you would use the Commutative Property of Multiplication to answer 7×3.

____

____



Multiply by 8

GET READY to Learn

There are 8 trees lining a street. In each tree, there are 6 birds. How many birds are there in all?

MAIN IDEA

I will learn to multiply by 8.

Standard 3NS2.2 **Memorize to automaticity the multiplication table for numbers between 1 and 10.**

Standard 3MR2.3 **Use a variety of methods, such as words, numbers, symbols,** charts, tables, **diagrams, and models, to explain mathematical reasoning.**

There are many ways to multiply by 8.

Real-World EXAMPLE — Use an Array

1. **BIRDS Find the number of birds in all if there are 6 birds in each of the 8 trees.**

You need to find 8×6.

Think of each tree as a group of 6 birds.

So, $8 \times 6 = 48$ birds in all.

You can change the order of the factors to find a related fact.

Real-World EXAMPLE — Use a Known Fact

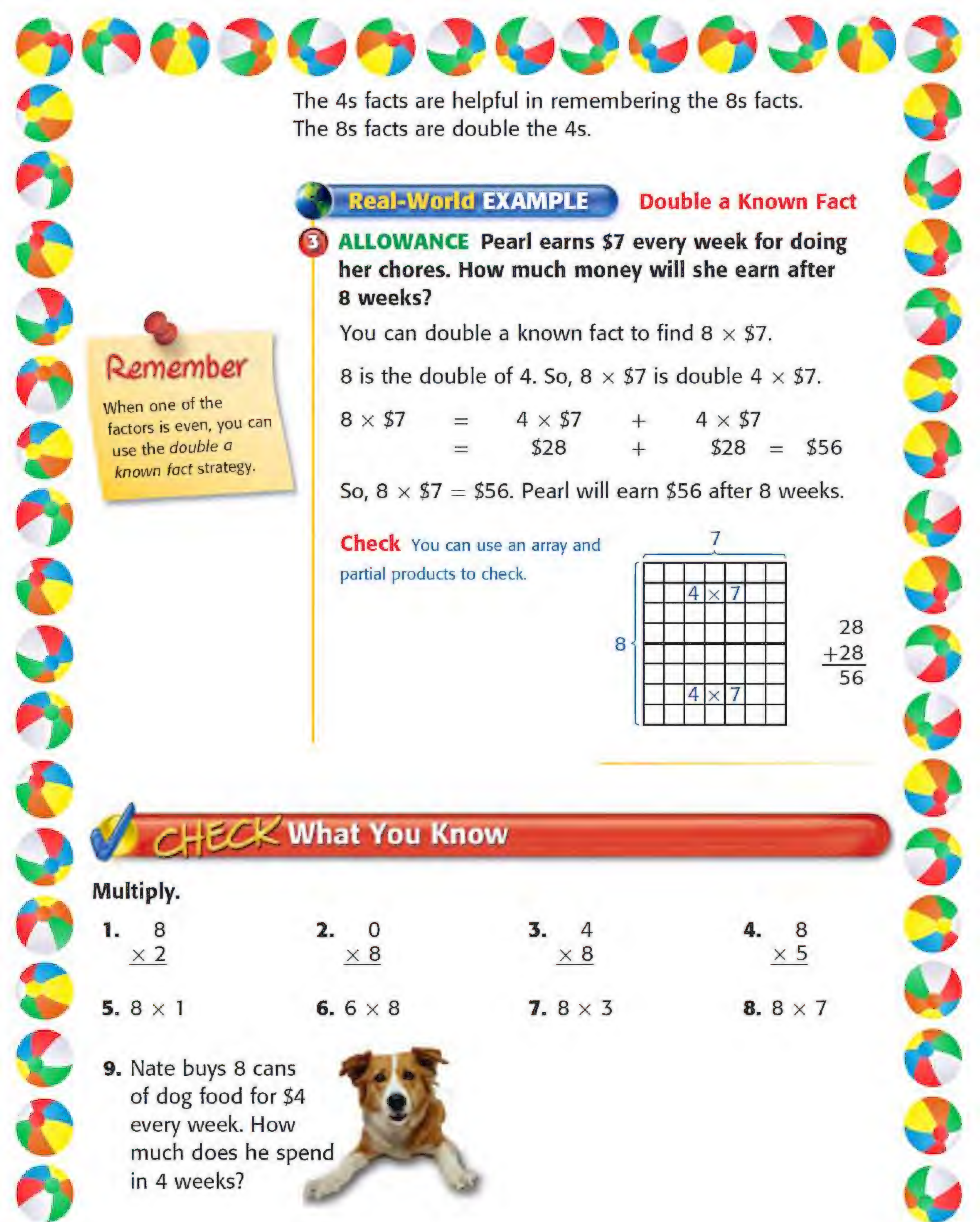
2. **BUTTONS Jaya has 8 shirts. There are 4 buttons on each shirt. How many buttons are there altogether?**

Think of each shirt as a group with 4 buttons in each group. You need to find 8×4.

You know that $4 \times 8 = 32$.

So, $8 \times 4 = 32$. Commutative Property

Jaya will sew 32 buttons on the shirts.



The 4s facts are helpful in remembering the 8s facts. The 8s facts are double the 4s.

Real-World EXAMPLE — Double a Known Fact

Remember
When one of the factors is even, you can use the *double a known fact* strategy.

3 **ALLOWANCE** **Pearl earns $7 every week for doing her chores. How much money will she earn after 8 weeks?**

You can double a known fact to find 8 × $7.

8 is the double of 4. So, 8 × $7 is double 4 × $7.

8 × $7	=	4 × $7	+	4 × $7		
	=	$28	+	$28	=	$56

So, 8 × $7 = $56. Pearl will earn $56 after 8 weeks.

Check You can use an array and partial products to check.

28
+28
56

CHECK What You Know

Multiply.

1. 8 × 2

2. 0 × 8

3. 4 × 8

4. 8 × 5

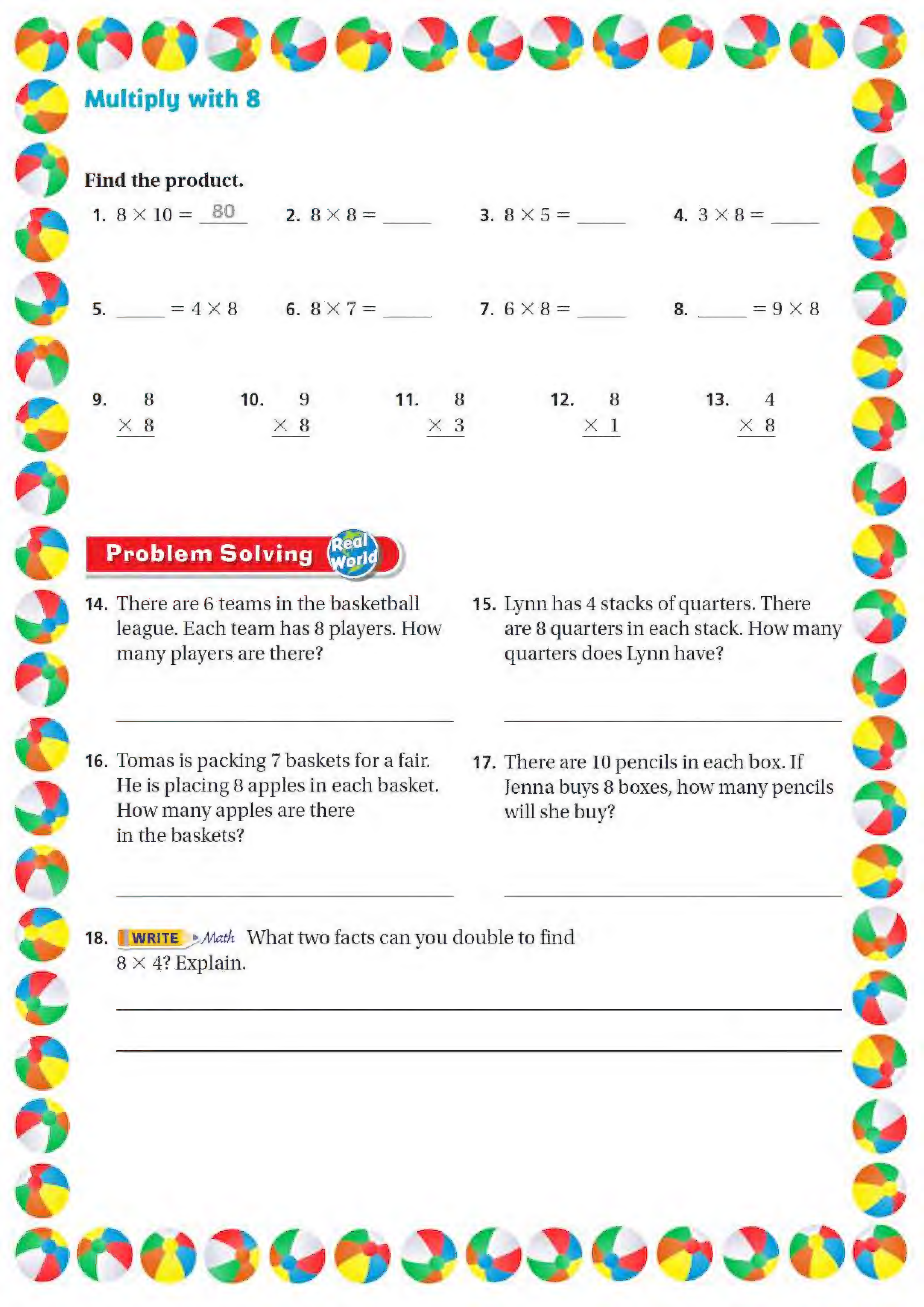
5. 8 × 1

6. 6 × 8

7. 8 × 3

8. 8 × 7

9. Nate buys 8 cans of dog food for $4 every week. How much does he spend in 4 weeks?



Multiply with 8

Find the product.

1. $8 \times 10 =$ 80
2. $8 \times 8 =$ _____
3. $8 \times 5 =$ _____
4. $3 \times 8 =$ _____
5. _____ $= 4 \times 8$
6. $8 \times 7 =$ _____
7. $6 \times 8 =$ _____
8. _____ $= 9 \times 8$
9. 8×8
10. 9×8
11. 8×3
12. 8×1
13. 4×8

Problem Solving Real World

14. There are 6 teams in the basketball league. Each team has 8 players. How many players are there?

_____

15. Lynn has 4 stacks of quarters. There are 8 quarters in each stack. How many quarters does Lynn have?

_____

16. Tomas is packing 7 baskets for a fair. He is placing 8 apples in each basket. How many apples are there in the baskets?

_____

17. There are 10 pencils in each box. If Jenna buys 8 boxes, how many pencils will she buy?

_____

18. WRITE Math What two facts can you double to find 8×4? Explain.

_____

_____



Multiply by 9

MAIN IDEA

I will learn to multiply by 9.

Standard 3NS2.2 Memorize to automaticity the multiplication table for numbers between 1 and 10.

Standard 3MR2.3 Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, and models, to explain mathematical reasoning.

GET READY to Learn

There are 9 packages of hamburger buns. Each package has the same number of buns. There are 8 buns in each package. How many buns are there in all?

To multiply by 9, you can use a known fact.

Real-World EXAMPLE — Use a Known Fact

1 **BUNS** **How many buns are there altogether?**

To solve the problem you can use a number sentence.

Number of packages		Number in each package		Total
9	×	8	=	■

You know $8 \times 9 = 72$.

So, $9 \times 8 = 72$. There are 72 buns.

Subtracting from a known fact will help you remember your 9s facts. Multiply the smaller factor by 10 and then subtract.

Real-World EXAMPLE — Subtract from a Known Fact

2 **STUDENTS** **How many students are there in 9 groups with 5 students in each group?**

To find 9×5 you can subtract from a known fact.

Step 1 9×5 is 9 groups of 5. Use the known fact of 10 groups of 5. $10 \times 5 = 50$

Step 2 Subtract 1 group of 5 to get or $50 - 5 = 45$.

So, $9 \times 5 = 45$ students.



You can use patterns to help remember the 9s facts. The second factor and the product in the 9s table create a pattern.

- The tens digit of the product is always 1 less than the factor that is multiplied by 9.
- The sum of the digits of the product equals 9.

$9 \times 1 = 9$
$9 \times 2 = 18$
$9 \times 3 = 27$
$9 \times 4 = 36$ ← 3 is one less than 4.
$9 \times 5 = 45$
$9 \times 6 = 54$
$9 \times 7 = 63$
$9 \times 8 = 72$ ← In 72, the sum of 7 and 2 is 9.
$9 \times 9 = 81$

Remember

The Commutative Property of Multiplication allows you to turn the fact around to see a known fact.

Real-World EXAMPLE Use Patterns

3 **MONEY** **Mr. Clancy bought 9 boxes of markers. Each box cost \$6. How much did he spend?**

Since the total cost is needed, multiply. Find $9 \times \$6$.

$9 \times \$6 \rightarrow \$5$ ← THINK $6 - 1 = 5$

$9 \times \$6 = \$54$ ← THINK $5 + ? = 9$, $5 + 4 = 9$

So, $9 \times \$6 = \$54$. Mr. Clancy spent \$54.

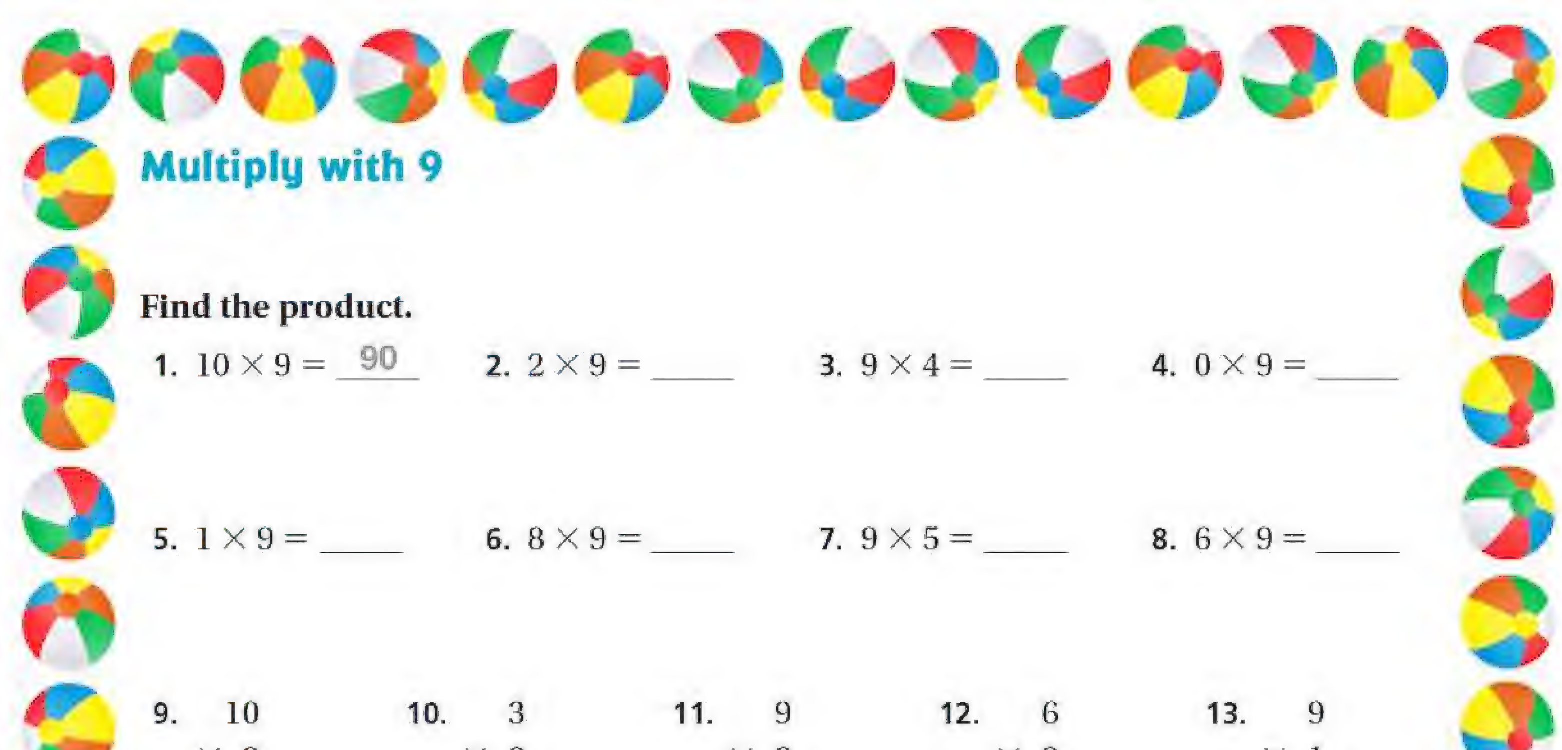
CHECK What You Know

Multiply.

1. 9×1 **2.** 4×9 **3.** 9×2 **4.** 6×9

5. 0×9 **6.** 9×3 **7.** 10×9 **8.** 7×9

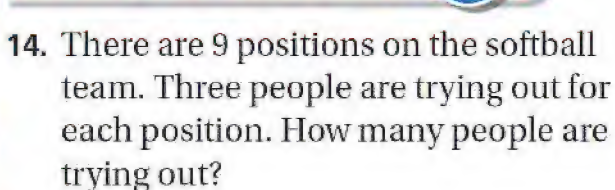
9. Lyle has 63 rocks in his collection. He places them into bags. Each bag holds 9 rocks. How many bags are there?



Multiply with 9

Find the product.

1. $10 \times 9 =$ 90
2. $2 \times 9 =$ _____
3. $9 \times 4 =$ _____
4. $0 \times 9 =$ _____
5. $1 \times 9 =$ _____
6. $8 \times 9 =$ _____
7. $9 \times 5 =$ _____
8. $6 \times 9 =$ _____
9. 10×9
10. 3×9
11. 9×8
12. 6×9
13. 9×1



14. There are 9 positions on the softball team. Three people are trying out for each position. How many people are trying out?

____

15. Carlos bought a book for $9. Now he would like to buy 4 other books for the same price. How much will he have to pay for the other 4 books?

____

16. WRITE Math Explain how you know whether to add or subtract when you use the Distributive Property to multiply.

____

____

Facts Practice

Multiply.

1. 4×6

2. 6×7

3. 3×9

4. 5×9

5. 4×2

6. 9×5

7. 2×8

8. 9×6

9. 8×9

10. 7×4

11. 8×3

12. 4×8

13. 5×8

14. 5×3

15. 8×6

16. 3×3

17. 4×5

18. 7×3

19. 2×7

20. 5×8

21. 6×5

22. 8×10

23. 9×8

24. 7×6

25. 6×6

26. 4×8

27. 8×5

28. 9×4

29. 6×2

30. 9×2

31. 3×7

32. 9×9

33. 1×1

34. 7×7

35. 5×5

36. 6×9



Extra Practice

Set A

Write a multiplication sentence for each array.

1.

2.

3.

4.

Set B

Find each product.

1. 5×2
2. 8×2
3. 10×2
4. 2×2
5. 9×2
6. 6×2

Set C

Multiply.

1. 4×6
2. 4×7
3. 10×4
4. 4×5
5. 4×4
6. 9×4

Set D

Find each product.

1. 5×5
2. 3×5
3. 7×5
4. 9×5
5. 4×5
6. 8×5

Set E

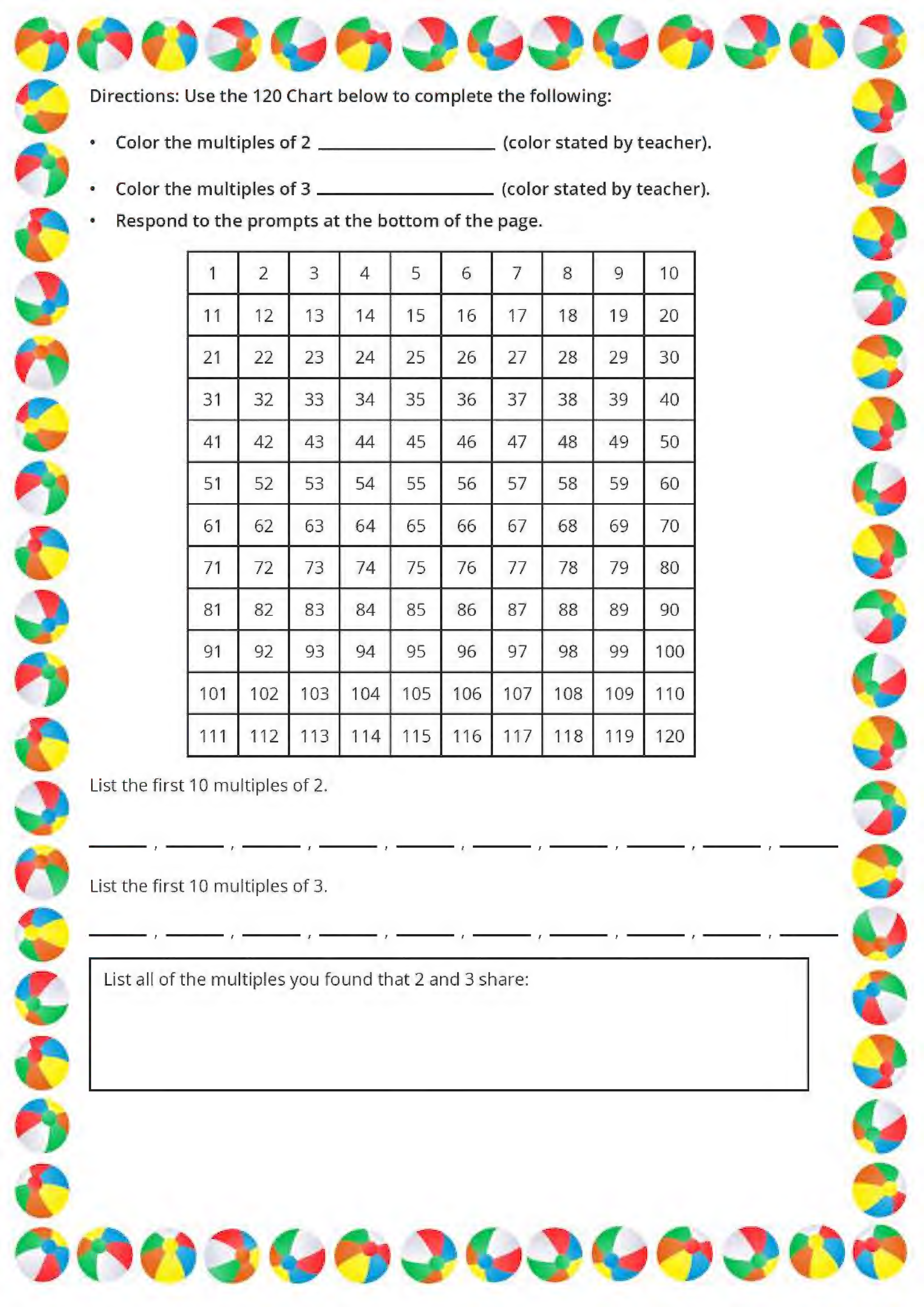
Multiply.

1. 10×6
2. 10×1
3. 10×4
4. 10×8
5. 7×10

Set F

Find each product.

1. 2×0
2. 0×1
3. 1×4
4. 3×0
5. 7×1



Directions: Use the 120 Chart below to complete the following:

- Color the multiples of 2 ____________________ (color stated by teacher).
- Color the multiples of 3 ____________________ (color stated by teacher).
- Respond to the prompts at the bottom of the page.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120

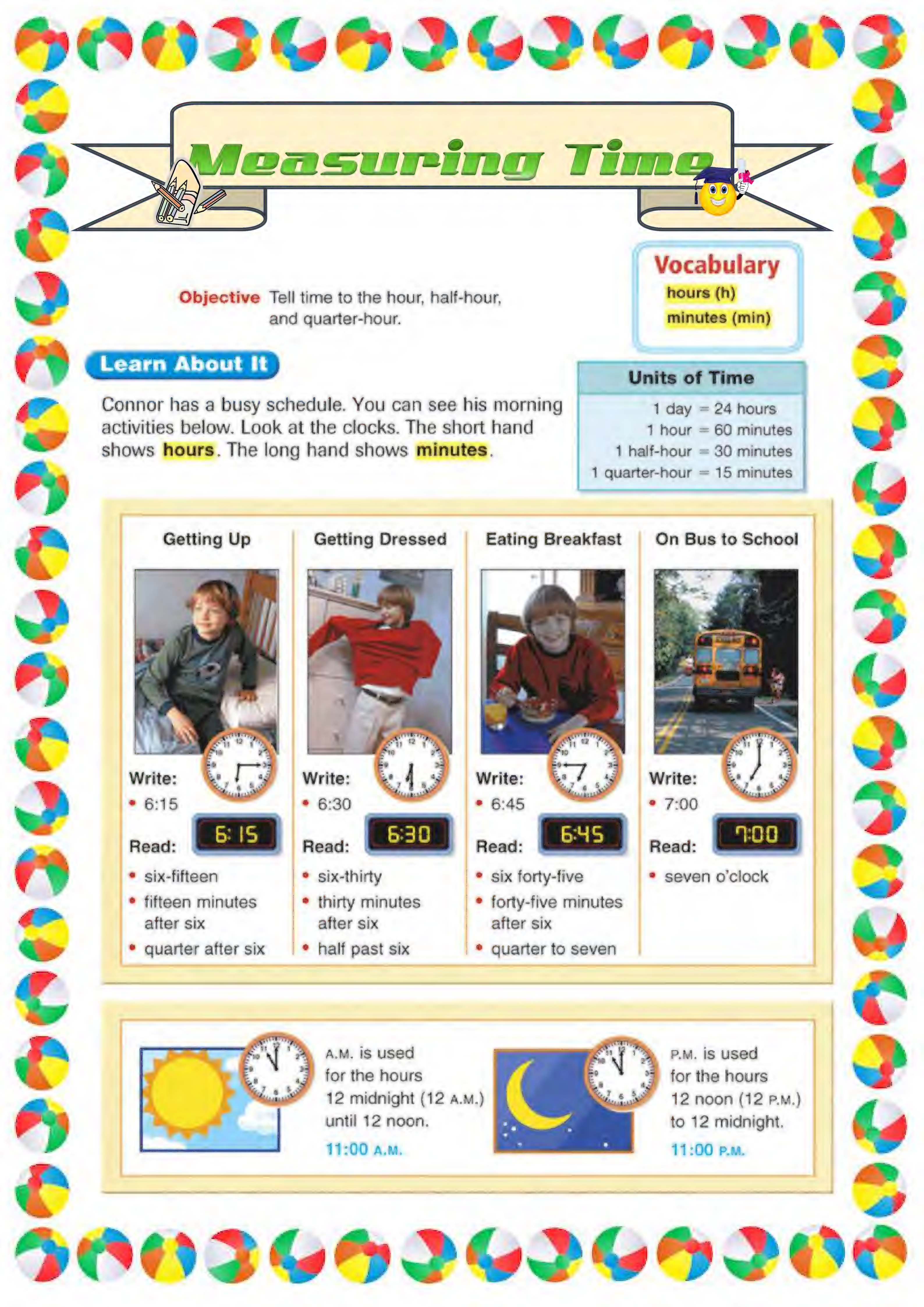
List the first 10 multiples of 2.

______ , ______ , ______ , ______ , ______ , ______ , ______ , ______ , ______ , ______

List the first 10 multiples of 3.

______ , ______ , ______ , ______ , ______ , ______ , ______ , ______ , ______ , ______

List all of the multiples you found that 2 and 3 share:



Measuring Time

Objective Tell time to the hour, half-hour, and quarter-hour.

Vocabulary
hours (h)
minutes (min)

Learn About It

Connor has a busy schedule. You can see his morning activities below. Look at the clocks. The short hand shows **hours**. The long hand shows **minutes**.

Units of Time

1 day	= 24 hours
1 hour	= 60 minutes
1 half-hour	= 30 minutes
1 quarter-hour	= 15 minutes

Getting Up

Write:
- 6:15

Read:
- six-fifteen
- fifteen minutes after six
- quarter after six

Getting Dressed

Write:
- 6:30

Read:
- six-thirty
- thirty minutes after six
- half past six

Eating Breakfast

Write:
- 6:45

Read:
- six forty-five
- forty-five minutes after six
- quarter to seven

On Bus to School

Write:
- 7:00

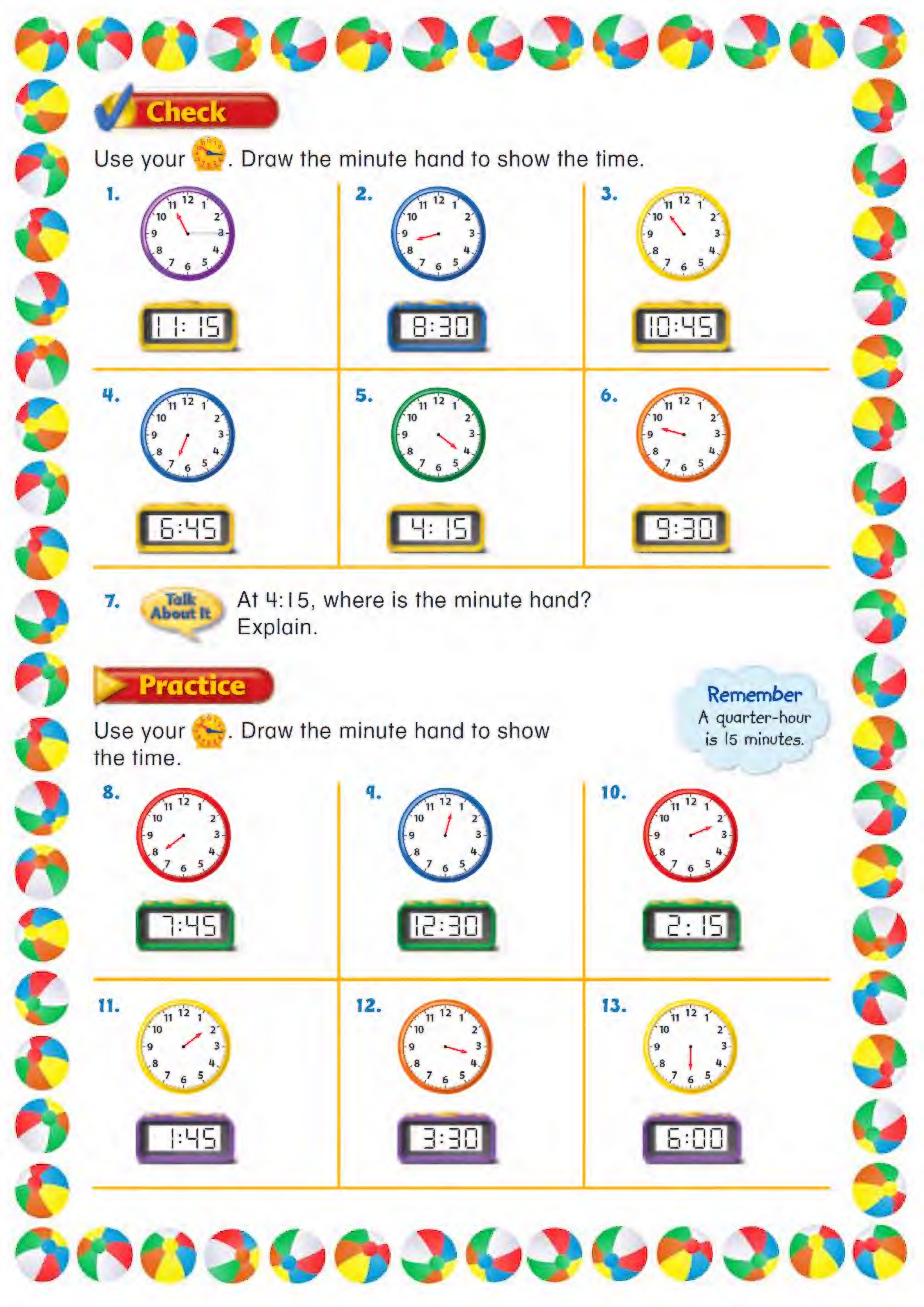
Read:
- seven o'clock

A.M. is used for the hours 12 midnight (12 A.M.) until 12 noon.

11:00 A.M.

P.M. is used for the hours 12 noon (12 P.M.) to 12 midnight.

11:00 P.M.



Check

Use your [clock]. Draw the minute hand to show the time.

1. 11:15
2. 8:30
3. 10:45
4. 6:45
5. 4:15
6. 9:30

7. Talk About It — At 4:15, where is the minute hand? Explain.

Practice

Use your [clock]. Draw the minute hand to show the time.

Remember
A quarter-hour is 15 minutes.

8. 7:45
9. 12:30
10. 2:15
11. 1:45
12. 3:30
13. 6:00

Time to Five Minutes

Objective Tell time to five minutes.

Learn About It

Connor's teacher gave him a schedule that lists when each class starts. Connor sees that it is time for math class.

How can you read the time shown on the clock?

Different Ways to Tell Time

Way 1 You can tell time by the number of minutes **after an hour**.

- The **hour hand** is between 9 and 10, so the time is after 9 o'clock.
- The **minute hand** is on 7. Start at 12 and count ahead by 5-minute steps.

Write: 9:35
Read: nine thirty-five, or 35 minutes after 9.

Remember It takes 5 minutes for the minute hand to move from one number to the next.

Way 2 You can tell time by the number of minutes **before an hour**.

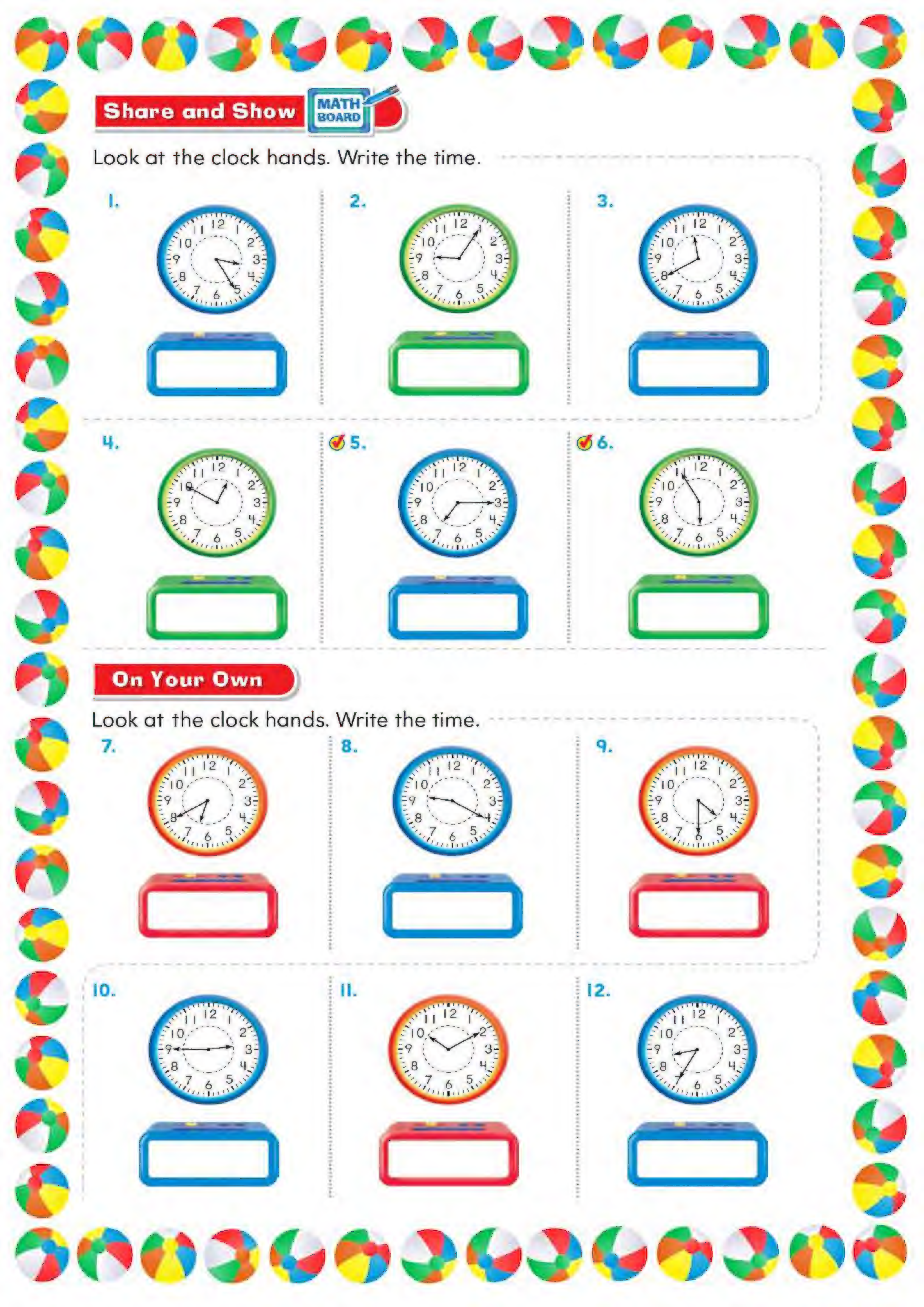
- The **hour hand** is between 9 and 10, so the time is before 10 o'clock.
- The **minute hand** is on 7. Start at 12 and count back to 7 by 5-minute steps.



Write: 9:35
Read: 25 minutes before 10.

Solution: The time 9:35 can be read as:

- nine thirty-five
- 35 minutes after 9
- 25 minutes before 10



Share and Show

MATH BOARD

Look at the clock hands. Write the time.

1.

2.

3.

4.

5.

6.

On Your Own

Look at the clock hands. Write the time.

7.

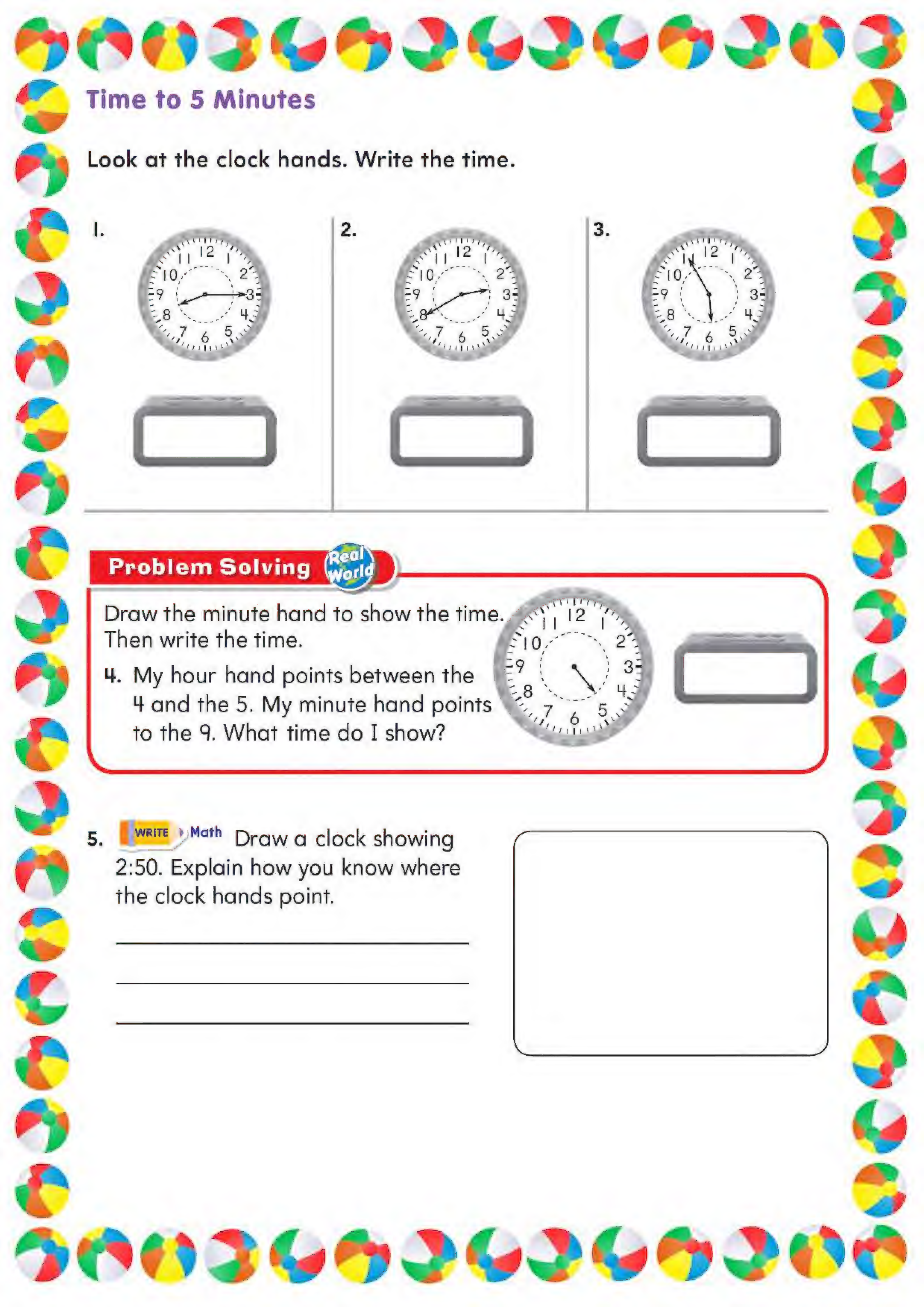
8.

9.

10.

11.

12.



Time to 5 Minutes

Look at the clock hands. Write the time.

1.

2.

3.

Problem Solving Real World

Draw the minute hand to show the time. Then write the time.

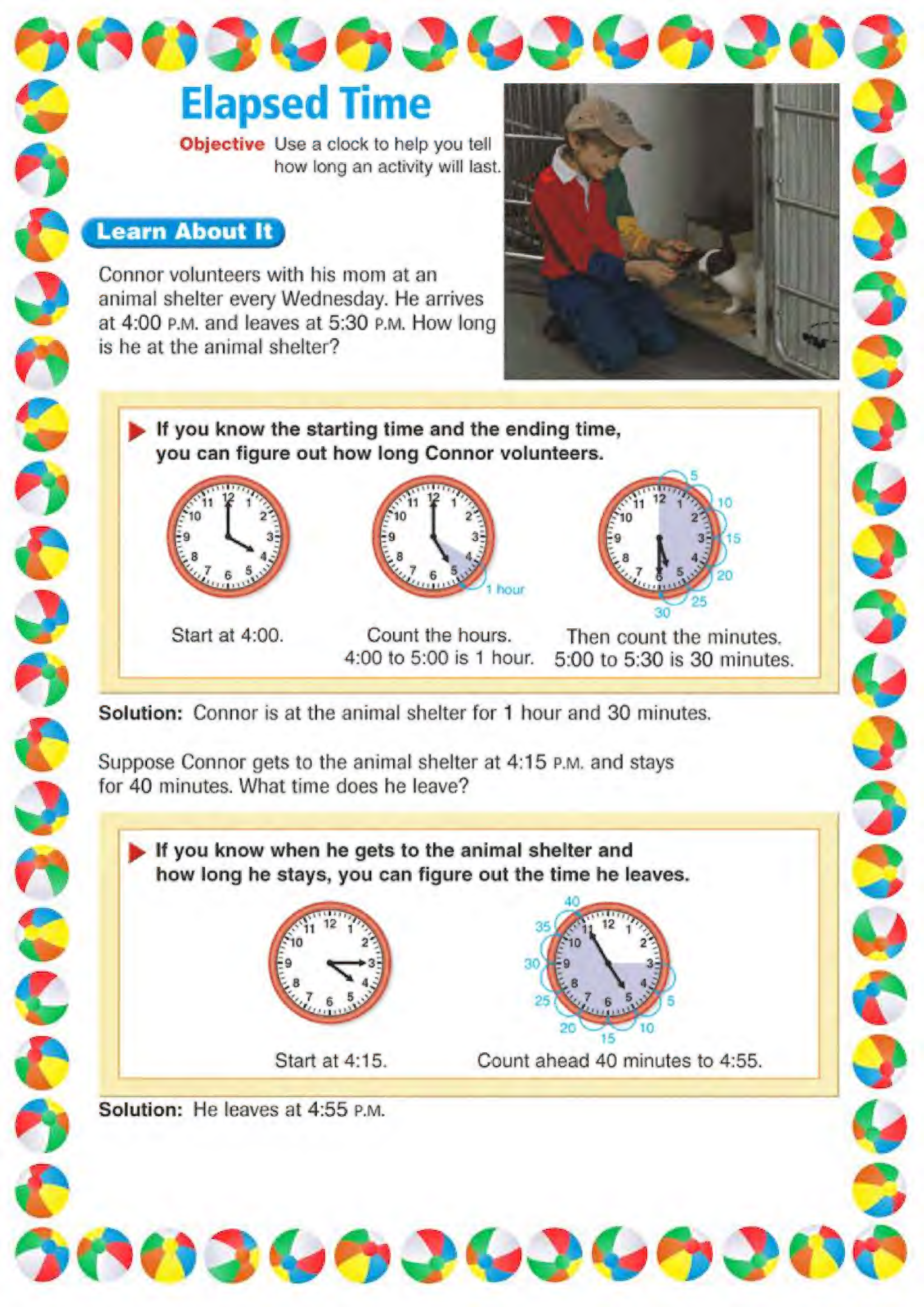
4. My hour hand points between the 4 and the 5. My minute hand points to the 9. What time do I show?

5. WRITE Math Draw a clock showing 2:50. Explain how you know where the clock hands point.

___

___

___



Elapsed Time

Objective Use a clock to help you tell how long an activity will last.

Learn About It

Connor volunteers with his mom at an animal shelter every Wednesday. He arrives at 4:00 P.M. and leaves at 5:30 P.M. How long is he at the animal shelter?

▶ **If you know the starting time and the ending time, you can figure out how long Connor volunteers.**

Start at 4:00.

Count the hours.
4:00 to 5:00 is 1 hour.

Then count the minutes.
5:00 to 5:30 is 30 minutes.

Solution: Connor is at the animal shelter for 1 hour and 30 minutes.

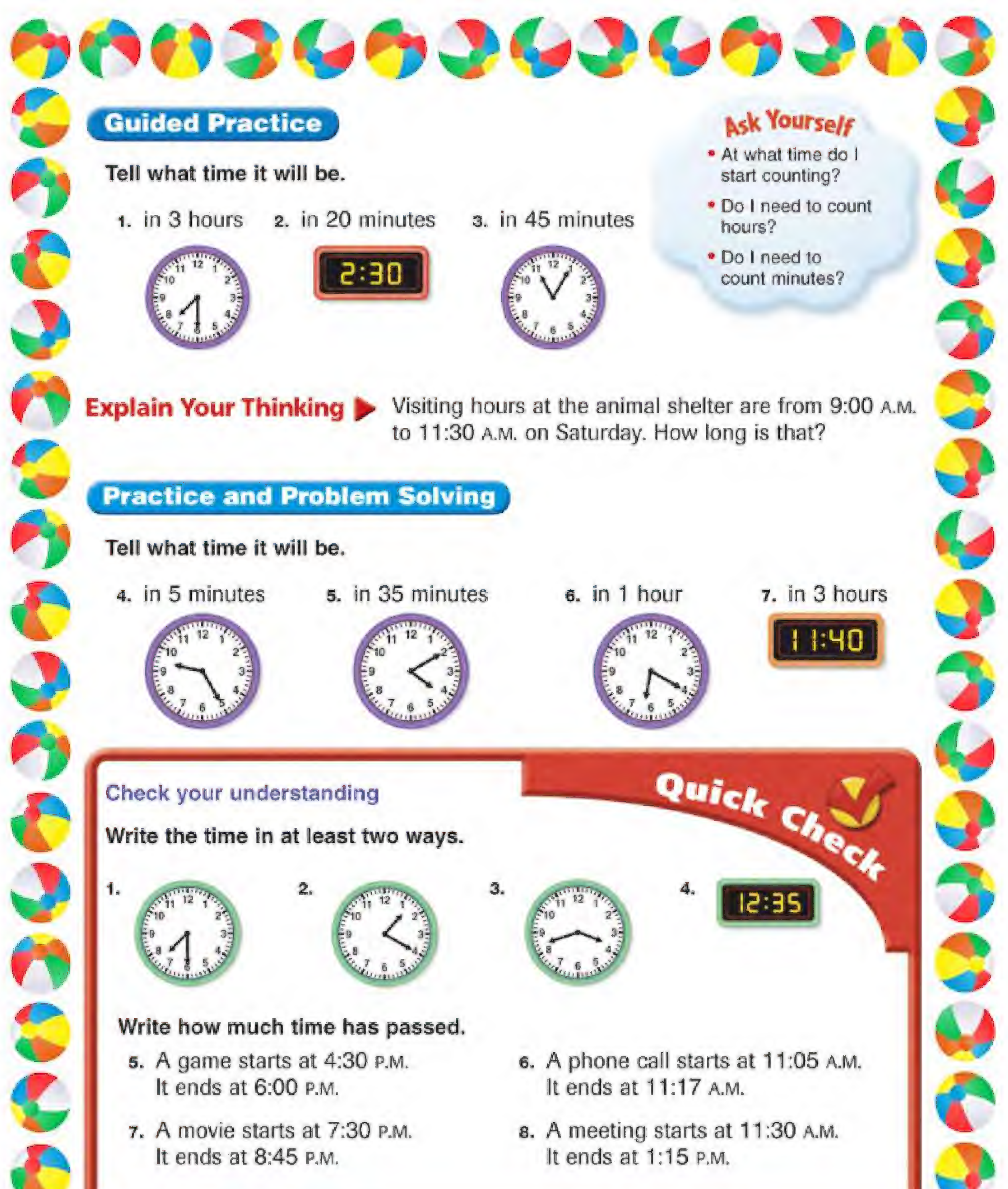
Suppose Connor gets to the animal shelter at 4:15 P.M. and stays for 40 minutes. What time does he leave?

▶ **If you know when he gets to the animal shelter and how long he stays, you can figure out the time he leaves.**

Start at 4:15.

Count ahead 40 minutes to 4:55.

Solution: He leaves at 4:55 P.M.



Guided Practice

Ask Yourself
- At what time do I start counting?
- Do I need to count hours?
- Do I need to count minutes?

Tell what time it will be.

1. in 3 hours
2. in 20 minutes
3. in 45 minutes

Explain Your Thinking ▶ Visiting hours at the animal shelter are from 9:00 A.M. to 11:30 A.M. on Saturday. How long is that?

Practice and Problem Solving

Tell what time it will be.

4. in 5 minutes
5. in 35 minutes
6. in 1 hour
7. in 3 hours

Quick Check

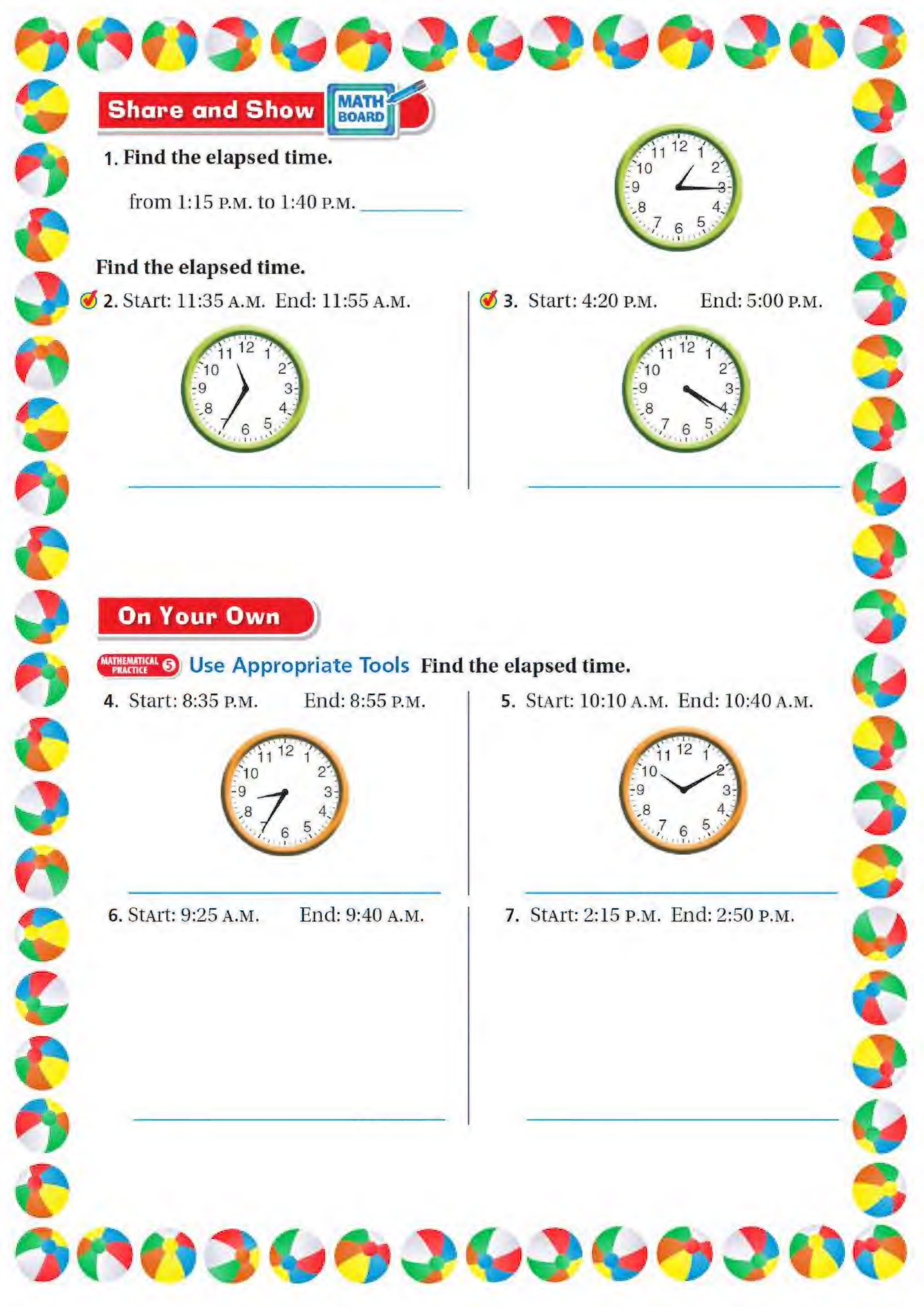
Check your understanding

Write the time in at least two ways.

1.
2.
3.
4.

Write how much time has passed.

5. A game starts at 4:30 P.M. It ends at 6:00 P.M.
6. A phone call starts at 11:05 A.M. It ends at 11:17 A.M.
7. A movie starts at 7:30 P.M. It ends at 8:45 P.M.
8. A meeting starts at 11:30 A.M. It ends at 1:15 P.M.



Share and Show MATH BOARD

1. Find the elapsed time.

from 1:15 P.M. to 1:40 P.M. ________

Find the elapsed time.

2. Start: 11:35 A.M. End: 11:55 A.M.

____

3. Start: 4:20 P.M. End: 5:00 P.M.

____

On Your Own

MATHEMATICAL PRACTICE 5 **Use Appropriate Tools** **Find the elapsed time.**

4. Start: 8:35 P.M. End: 8:55 P.M.

____

5. Start: 10:10 A.M. End: 10:40 A.M.

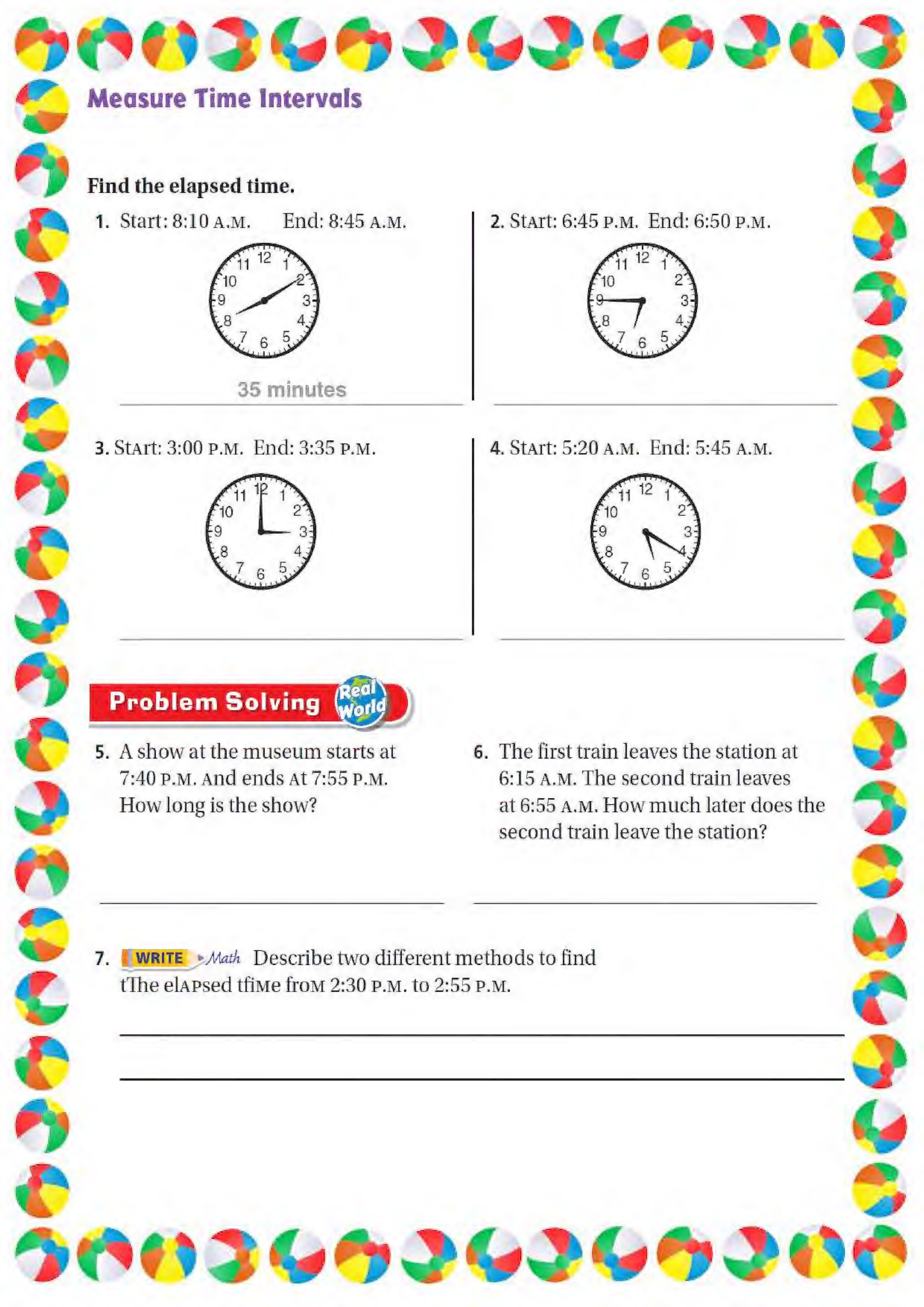
____

6. Start: 9:25 A.M. End: 9:40 A.M.

____

7. Start: 2:15 P.M. End: 2:50 P.M.

____



Measure Time Intervals

Find the elapsed time.

1. Start: 8:10 A.M. End: 8:45 A.M.

35 minutes

2. StArt: 6:45 P.M. End: 6:50 P.M.

3. StArt: 3:00 P.M. End: 3:35 P.M.

4. StArt: 5:20 A.M. End: 5:45 A.M.

Problem Solving Real World

5. A show at the museum starts at 7:40 P.M. And ends At 7:55 P.M. How long is the show?

6. The first train leaves the station at 6:15 A.M. The second train leaves at 6:55 A.M. How much later does the second train leave the station?

7. WRITE Math Describe two different methods to find tThe elApsed tfiMe froM 2:30 P.M. to 2:55 P.M.



CHALLENGE: Time Story Problems

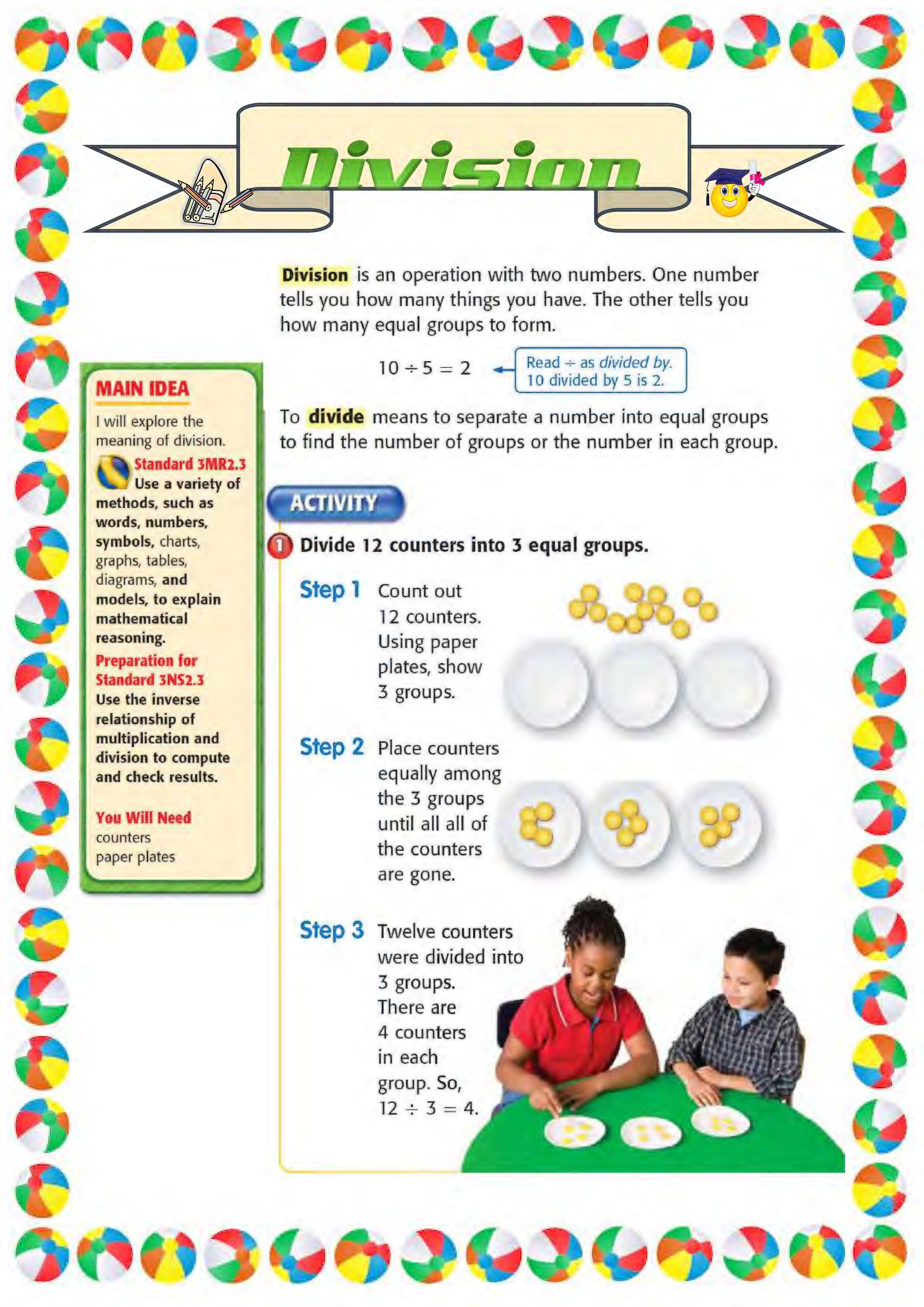
1. Your mom puts muffins in the oven at 7:00. When you take them out, the clock looks like this:

How many minutes did it take to bake the muffins?

2. You leave school at 3:00 and when you get home the clock looks like this:

How many minutes did it take you to walk home?

3. If it takes you 45 minutes to walk home from school and you leave at 3:00, what time will it be when you get home? Draw the time on the clock.



Division

Division is an operation with two numbers. One number tells you how many things you have. The other tells you how many equal groups to form.

$10 \div 5 = 2$ ← Read ÷ as *divided by*. 10 divided by 5 is 2.

To **divide** means to separate a number into equal groups to find the number of groups or the number in each group.

MAIN IDEA

I will explore the meaning of division.

Standard 3MR2.3 Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, and models, to explain mathematical reasoning.

Preparation for Standard 3NS2.3 Use the inverse relationship of multiplication and division to compute and check results.

You Will Need
counters
paper plates

ACTIVITY

1 Divide 12 counters into 3 equal groups.

Step 1 Count out 12 counters. Using paper plates, show 3 groups.

Step 2 Place counters equally among the 3 groups until all all of the counters are gone.

Step 3 Twelve counters were divided into 3 groups. There are 4 counters in each group. So, $12 \div 3 = 4$.



ACTIVITY

2 **Group 12 counters 3 at a time. How many groups are there?**

Step 1 Count out 12 counters.

Step 2 Make equal groups of 3 until all the counters are gone.

There are 4 equal groups of 3.
So, $12 \div 4 = 3$.

Think About It

1. Explain how you divided 12 counters into equal groups.
2. When you divided the counters into groups of 3, how did you find the number of equal groups?

CHECK What You Know

3. Make equal groups to find the number of counters in each group.
4. Find the number of equal groups of 5.
5. Copy the chart. Then use counters to help complete.

Number of Counters	Number of Equal Groups	Number in Each Group	Division Sentence
9	3	3	$9 \div 3 = 3$
14	2		
15		5	
6		3	



Draw a circle around the correct number of stars to show each division problem. Complete each number sentence.

1. 8 ÷ 2 = 4

2. 6 ÷ 3 = ____

3. 12 ÷ 3 = ____

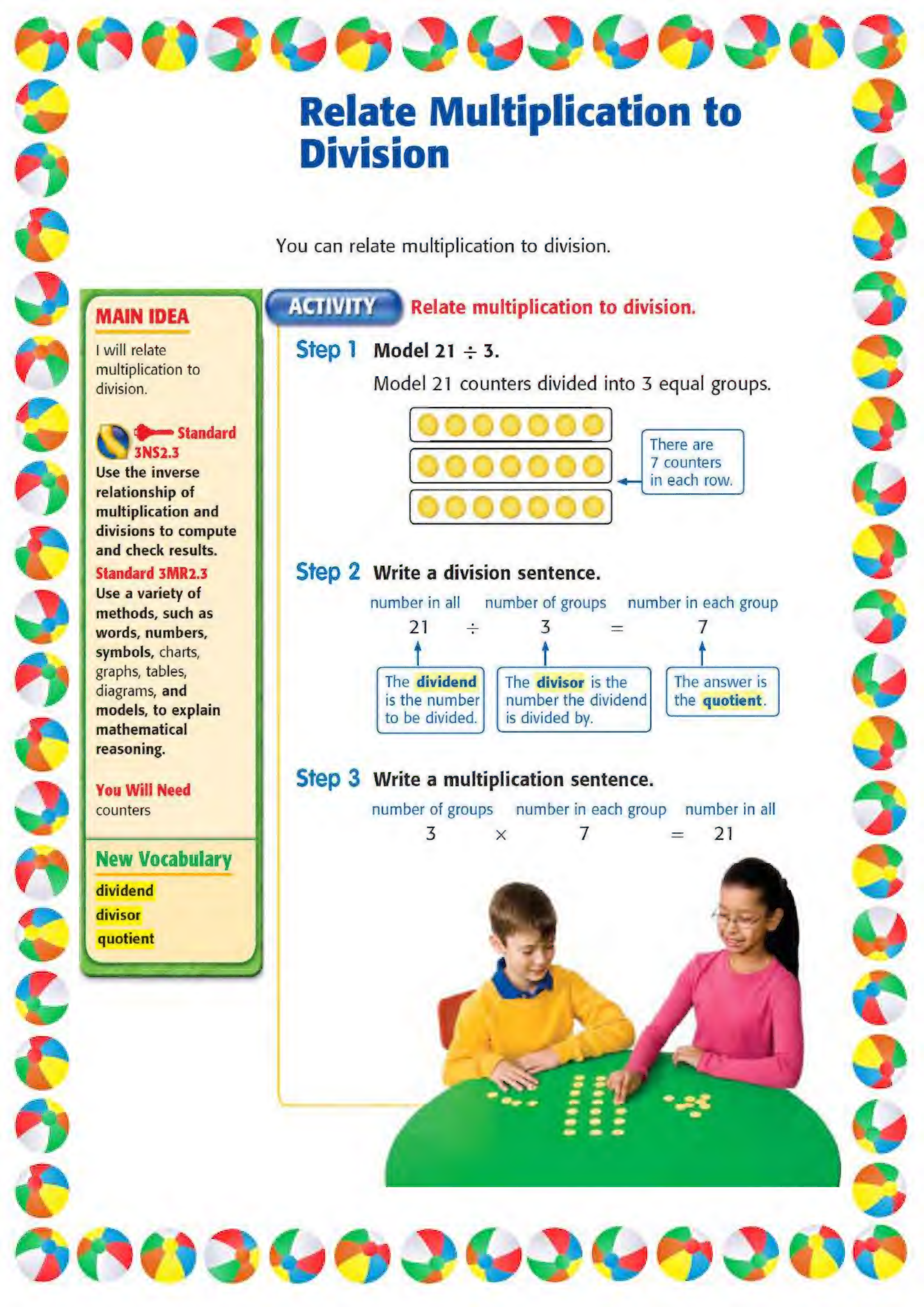
4. 10 ÷ 2 = ____

5. 18 ÷ 3 = ____

6. 9 ÷ 3 = ____

7. 16 ÷ 2 = ____

8. 15 ÷ 3 = ____



Relate Multiplication to Division

You can relate multiplication to division.

MAIN IDEA

I will relate multiplication to division.

Standard 3NS2.3 Use the inverse relationship of multiplication and divisions to compute and check results.

Standard 3MR2.3 Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, and models, to explain mathematical reasoning.

You Will Need

counters

New Vocabulary

dividend
divisor
quotient

ACTIVITY Relate multiplication to division.

Step 1 **Model 21 ÷ 3.**

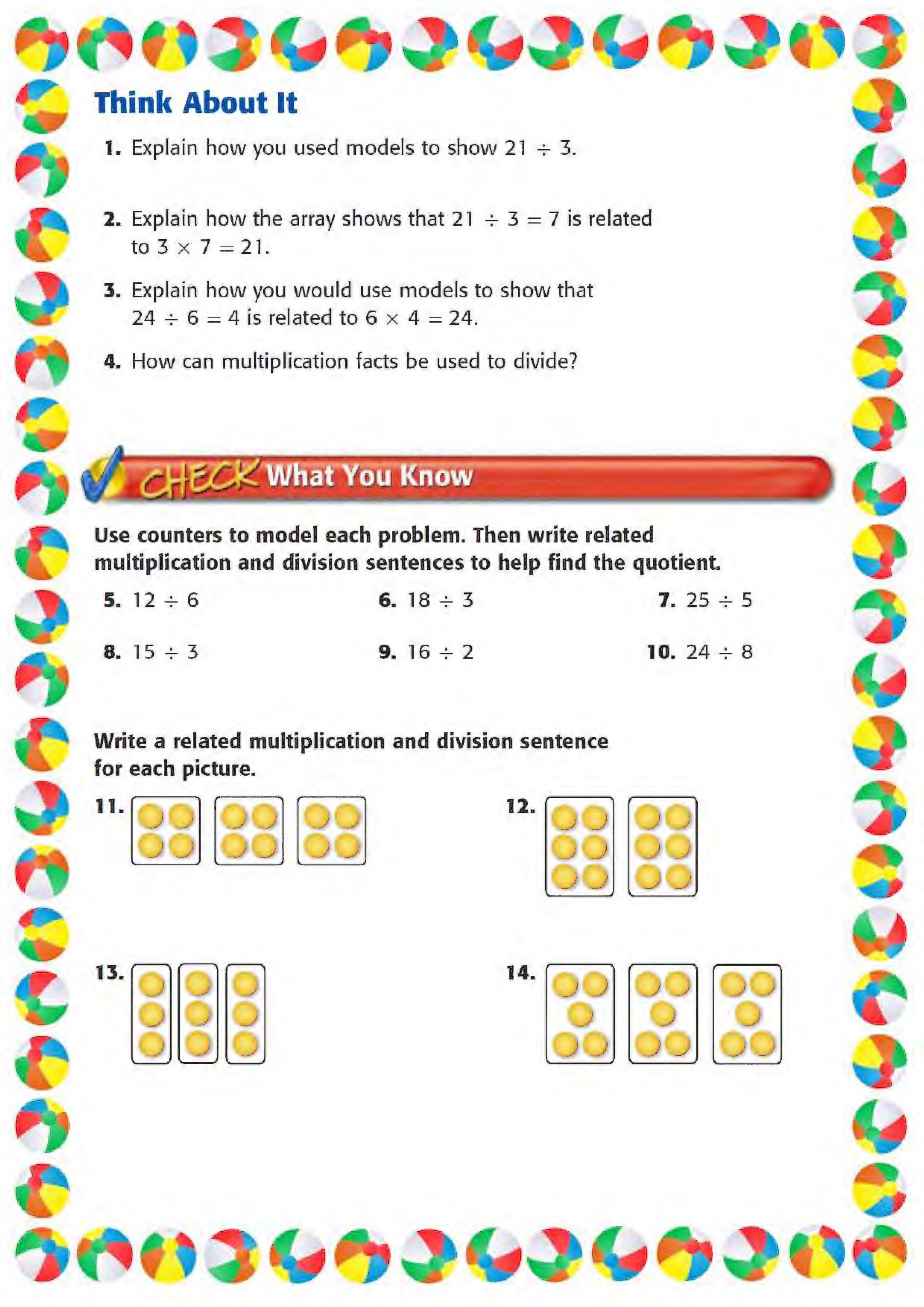
Model 21 counters divided into 3 equal groups.

Step 2 **Write a division sentence.**

number in all		number of groups		number in each group
21	÷	3	=	7
The **dividend** is the number to be divided.		The **divisor** is the number the dividend is divided by.		The answer is the **quotient**.

Step 3 **Write a multiplication sentence.**

number of groups		number in each group		number in all
3	×	7	=	21



Think About It

1. Explain how you used models to show $21 \div 3$.

2. Explain how the array shows that $21 \div 3 = 7$ is related to $3 \times 7 = 21$.

3. Explain how you would use models to show that $24 \div 6 = 4$ is related to $6 \times 4 = 24$.

4. How can multiplication facts be used to divide?

CHECK What You Know

Use counters to model each problem. Then write related multiplication and division sentences to help find the quotient.

5. $12 \div 6$
6. $18 \div 3$
7. $25 \div 5$
8. $15 \div 3$
9. $16 \div 2$
10. $24 \div 8$

Write a related multiplication and division sentence for each picture.

11.

12.

13.

14.



Share and Show



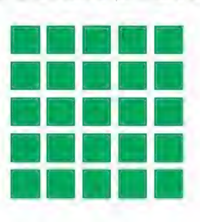
1. Complete the related facts for this array.



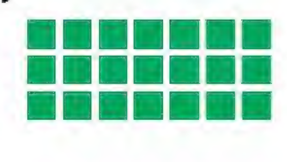
$2 \times 8 = 16$ $16 \div 2 = 8$

________ ________

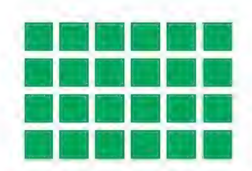
Write the related facts for the array.

2. 

____
____
____
____

3. 

____
____
____
____

4. 

____
____
____
____

5. Why do the related facts for the array in Exercise 2 have only two equations?

____

Write the related facts for the set of numbers.

6. 2, 5, 10

____
____
____
____

7. 3, 8, 24



____
____
____
____

8. 6, 6, 36

____
____
____
____

Complete the related facts.

9. $4 \times 7 = ___$

$7 \times ___ = 28$

$28 \div ___ = 4$

$28 \div 4 = ___$

10. $5 \times ___ = 30$

$6 \times ___ = 30$

$30 \div 6 = ___$

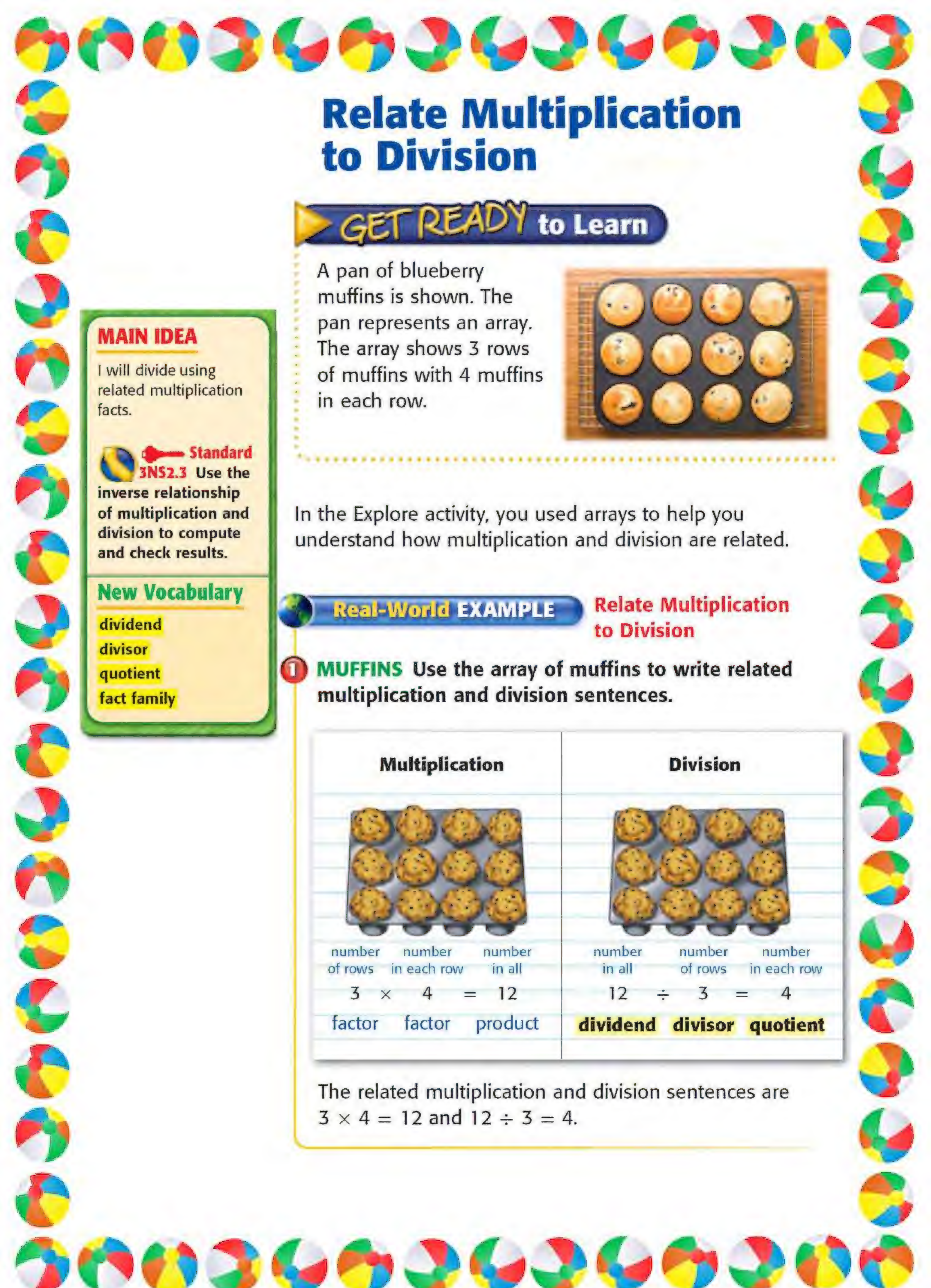
$30 \div 5 = ___$

11. $___ \times 9 = 27$

$___ \times 3 = 27$

$___ \div 9 = 3$

$27 \div ___ = 9$



Relate Multiplication to Division

GET READY to Learn

A pan of blueberry muffins is shown. The pan represents an array. The array shows 3 rows of muffins with 4 muffins in each row.

MAIN IDEA

I will divide using related multiplication facts.

Standard 3NS2.3 Use the inverse relationship of multiplication and division to compute and check results.

New Vocabulary

- dividend
- divisor
- quotient
- fact family

In the Explore activity, you used arrays to help you understand how multiplication and division are related.

Real-World EXAMPLE Relate Multiplication to Division

1 **MUFFINS** Use the array of muffins to write related multiplication and division sentences.

Multiplication					Division				
number of rows		number in each row		number in all	number in all		number of rows		number in each row
3	×	4	=	12	12	÷	3	=	4
factor		factor		product	**dividend**		**divisor**		**quotient**

The related multiplication and division sentences are $3 \times 4 = 12$ and $12 \div 3 = 4$.



A group of related facts using the same numbers is a **fact family**.

Fact Family for 3, 4, and 12	Fact Family for 7 and 49
3 × 4 = 12	7 × 7 = 49
4 × 3 = 12	49 ÷ 7 = 7
12 ÷ 3 = 4	
12 ÷ 4 = 3	

EXAMPLE Write a Fact Family

Remember

Thinking about numbers in a fact family can help you remember related facts.

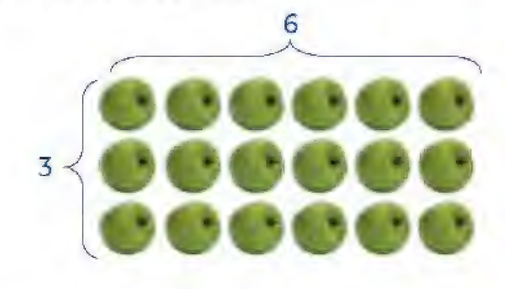
2 **Use the fact family 3, 6, 18 to write four related multiplication and division sentences.**

3 × 6 = 18

6 × 3 = 18

18 ÷ 3 = 6

18 ÷ 6 = 3

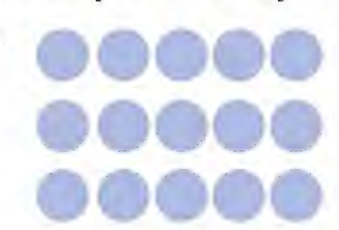


Notice each fact uses the same three numbers.

CHECK What You Know

Use the array to complete each pair of number sentences.

1. ■ × 5 = 15
■ ÷ 3 = 5



2. 4 × ■ = 24
24 ÷ ■ = 6



Write the fact family for each set of numbers.

3. 2, 6, 12

4. 4, 5, 20

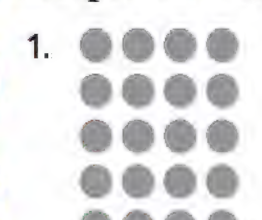
5. 3, 9, 27

6. Gwen has 20 marbles and wants to divide them equally into 5 bags. How many bags will she need?





Complete the equations.

1. 

5 rows of 4 = 20

5 × 4 = 20

20 ÷ 5 = 4

2.

4 rows of ____ = 24

4 × ____ = 24

24 ÷ 4 = ____

3.

3 rows of ____ = 24

3 × ____ = 24

24 ÷ 3 = ____

Complete the equations.

4. 4 × ____ = 28 28 ÷ 4 = ____

5. 6 × ____ = 36 36 ÷ 6 = ____

6. 4 × ____ = 36 36 ÷ 4 = ____

7. 8 × ____ = 40 40 ÷ 8 = ____

Problem Solving



8. Mr. Martin buys 36 muffins for a class breakfast. He places them on plates for his students. If he places 9 muffins on each plate, how many plates does Mr. Martin use?

____

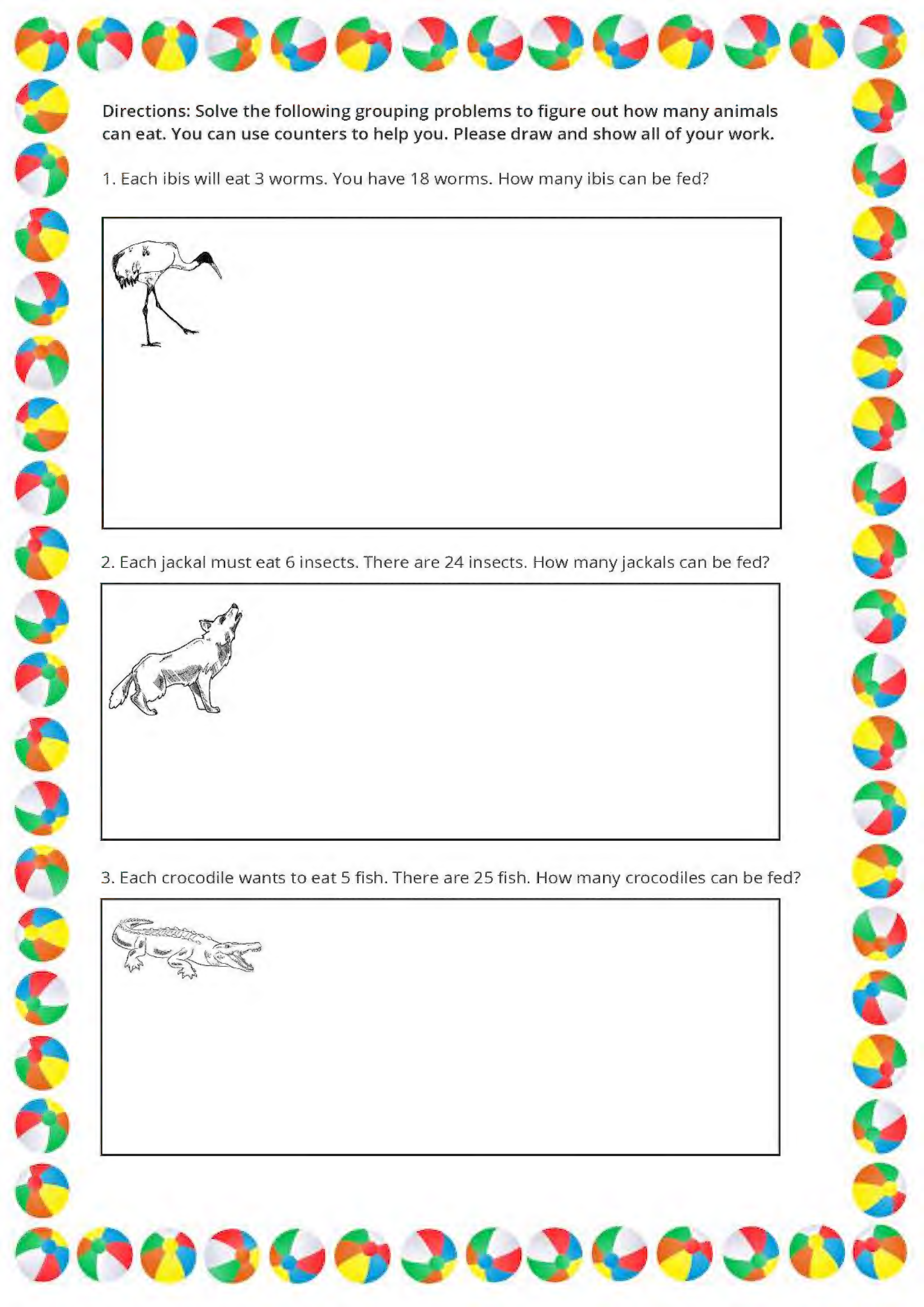
9. Ralph read 18 books during his summer vacation. He read the same number of books each month for 3 months. How many books did he read each month?

____

10. **WRITE** *Math* Use examples to show that multiplication and division are inverse operations.

____

____

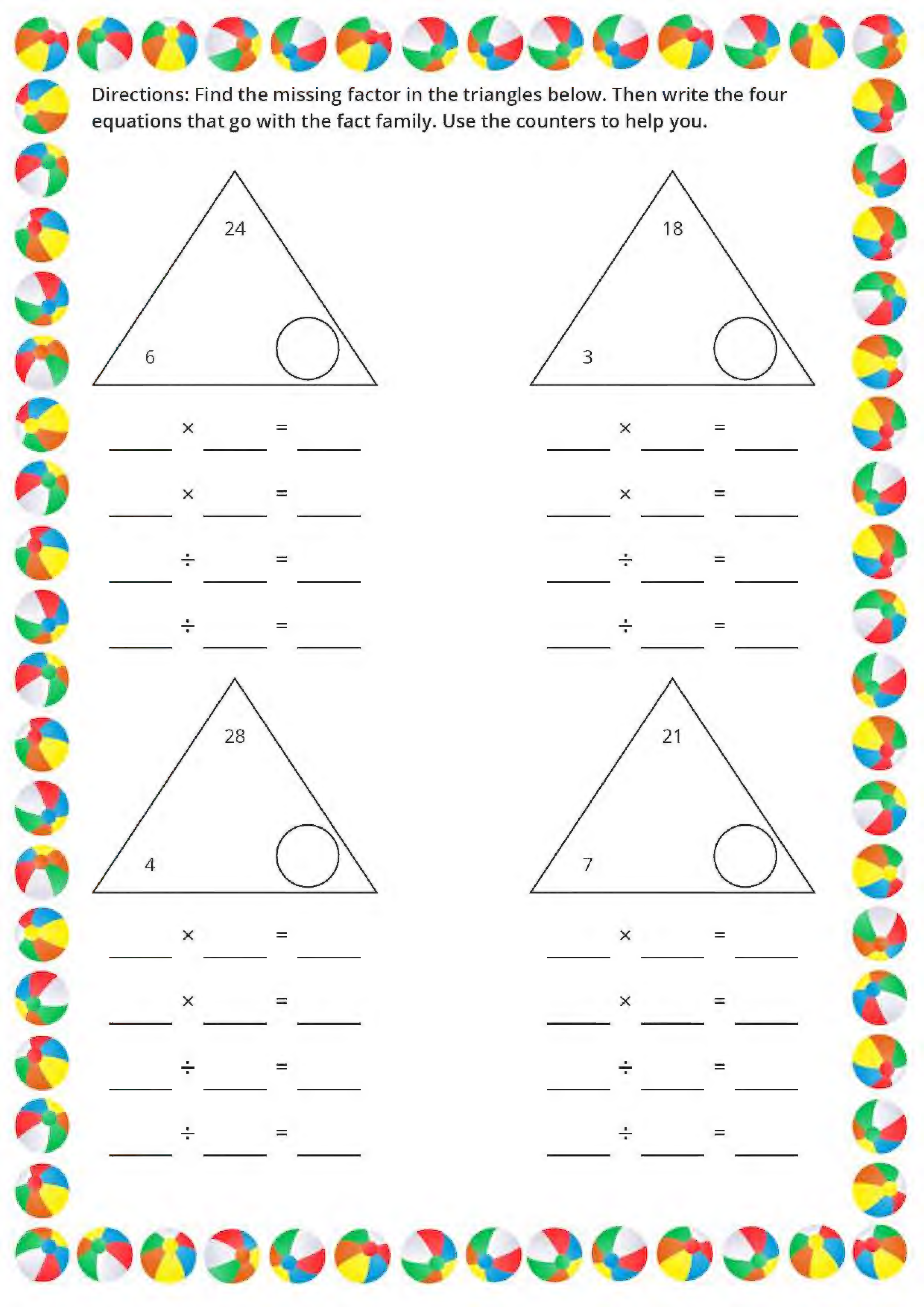


Directions: Solve the following grouping problems to figure out how many animals can eat. You can use counters to help you. Please draw and show all of your work.

1. Each ibis will eat 3 worms. You have 18 worms. How many ibis can be fed?

2. Each jackal must eat 6 insects. There are 24 insects. How many jackals can be fed?

3. Each crocodile wants to eat 5 fish. There are 25 fish. How many crocodiles can be fed?



Directions: Find the missing factor in the triangles below. Then write the four equations that go with the fact family. Use the counters to help you.

_____ × _____ = _____

_____ × _____ = _____

_____ ÷ _____ = _____

_____ ÷ _____ = _____

_____ × _____ = _____

_____ × _____ = _____

_____ ÷ _____ = _____

_____ ÷ _____ = _____

_____ × _____ = _____

_____ × _____ = _____

_____ ÷ _____ = _____

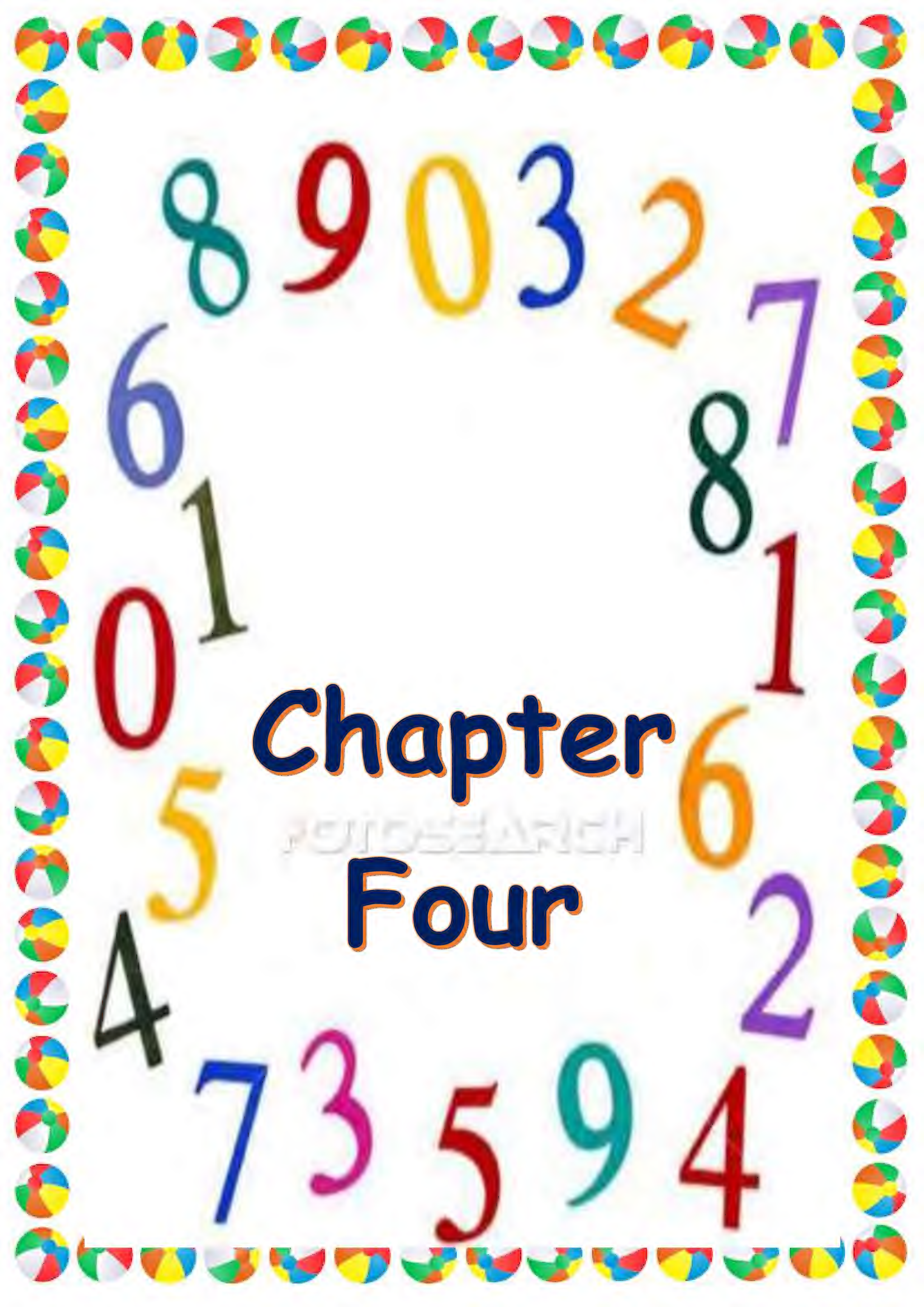
_____ ÷ _____ = _____

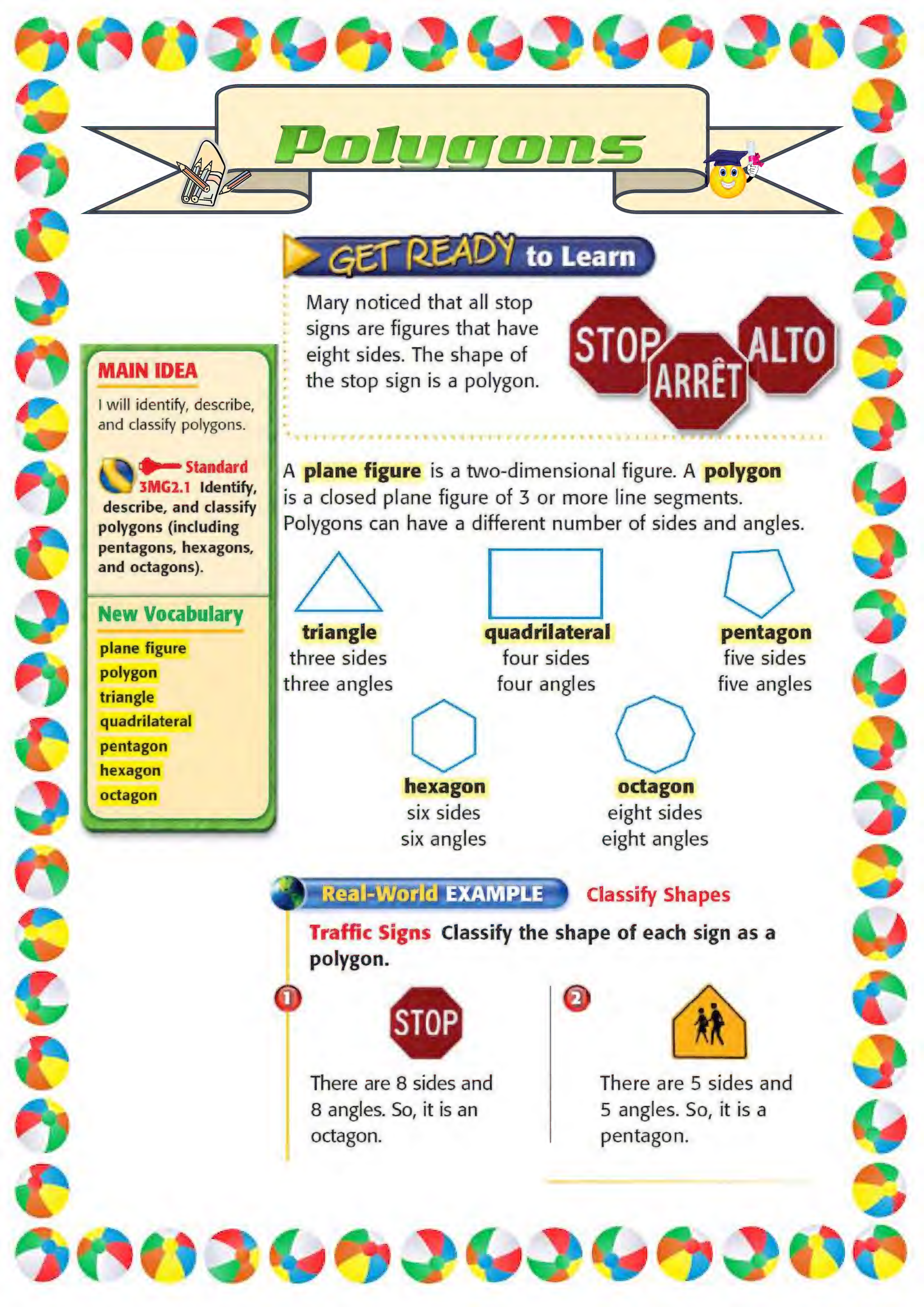
_____ × _____ = _____

_____ × _____ = _____

_____ ÷ _____ = _____

_____ ÷ _____ = _____


Chapter
Four



Polygons

GET READY to Learn

Mary noticed that all stop signs are figures that have eight sides. The shape of the stop sign is a polygon.

MAIN IDEA

I will identify, describe, and classify polygons.

Standard 3MG2.1 Identify, describe, and classify polygons (including pentagons, hexagons, and octagons).

New Vocabulary

- plane figure
- polygon
- triangle
- quadrilateral
- pentagon
- hexagon
- octagon

A **plane figure** is a two-dimensional figure. A **polygon** is a closed plane figure of 3 or more line segments. Polygons can have a different number of sides and angles.

triangle
three sides
three angles

quadrilateral
four sides
four angles

pentagon
five sides
five angles

hexagon
six sides
six angles

octagon
eight sides
eight angles

Real-World EXAMPLE Classify Shapes

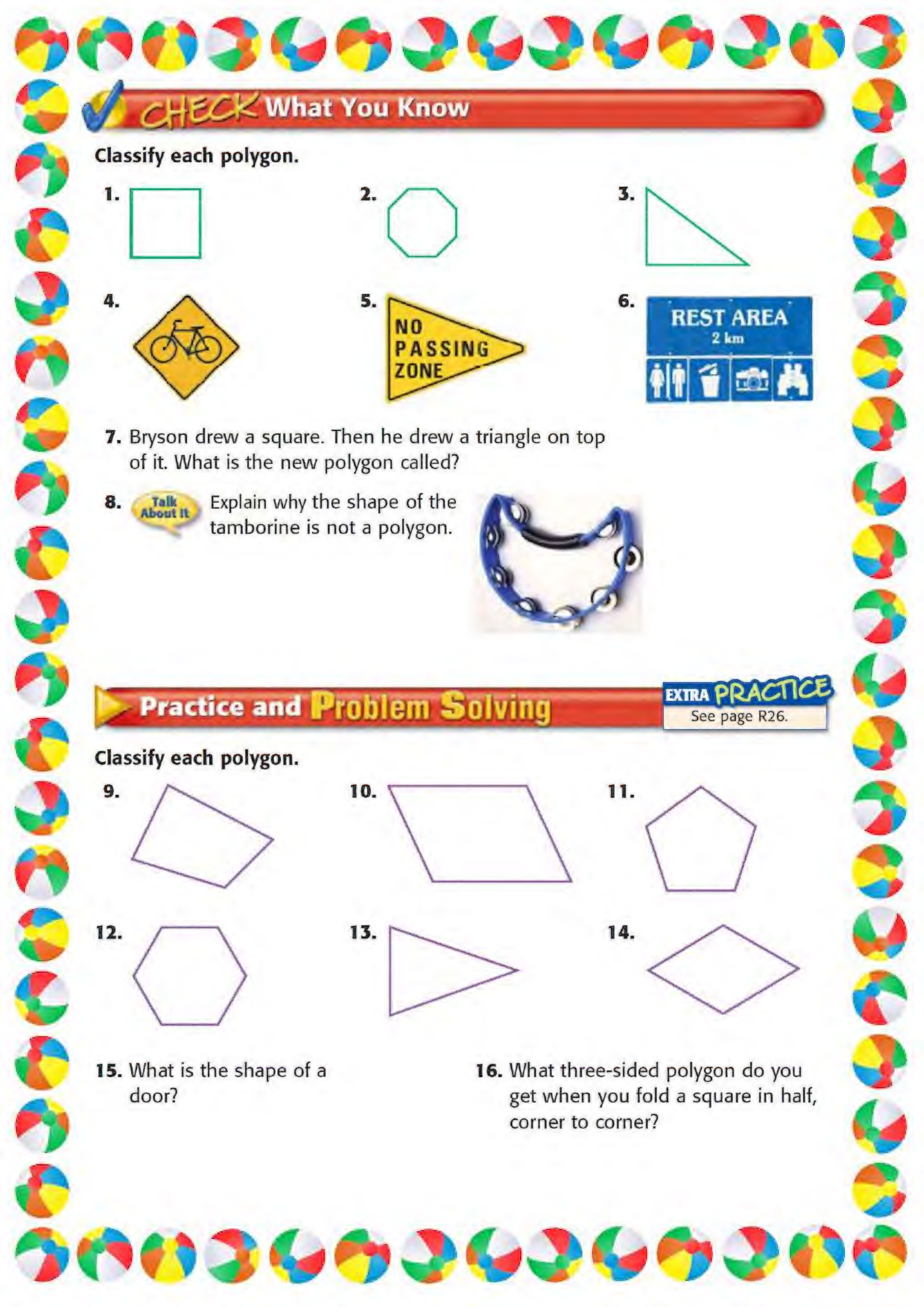
Traffic Signs **Classify the shape of each sign as a polygon.**

1

There are 8 sides and 8 angles. So, it is an octagon.

2

There are 5 sides and 5 angles. So, it is a pentagon.



CHECK What You Know

Classify each polygon.

1.

2.

3.

4.

5.

6.

7. Bryson drew a square. Then he drew a triangle on top of it. What is the new polygon called?

8. Talk About It Explain why the shape of the tamborine is not a polygon.

Practice and Problem Solving

EXTRA PRACTICE See page R26.

Classify each polygon.

9.

10.

11.

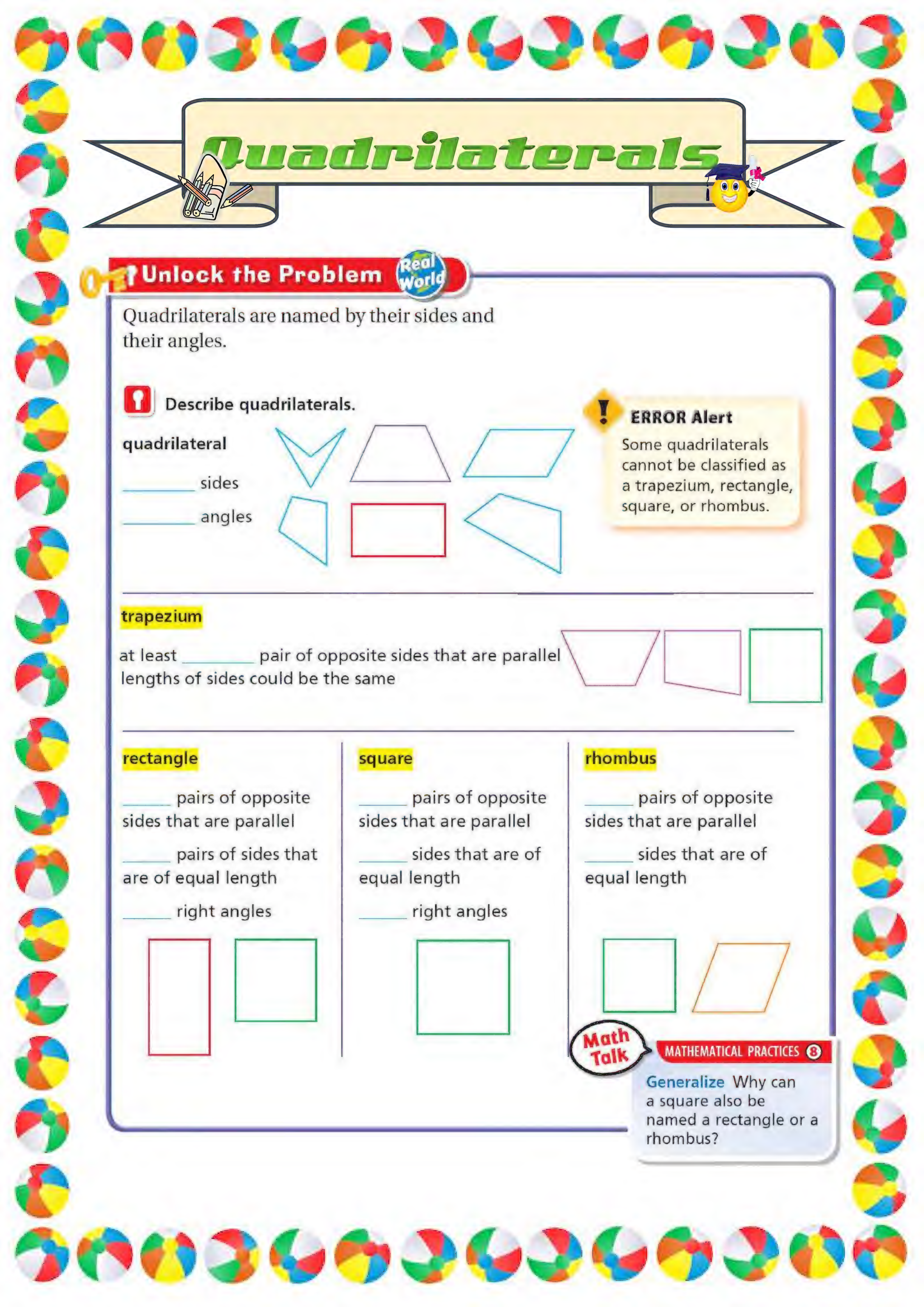
12.

13.

14.

15. What is the shape of a door?

16. What three-sided polygon do you get when you fold a square in half, corner to corner?



Quadrilaterals

Unlock the Problem (Real World)

Quadrilaterals are named by their sides and their angles.

Describe quadrilaterals.

quadrilateral

______ sides

______ angles

ERROR Alert

Some quadrilaterals cannot be classified as a trapezium, rectangle, square, or rhombus.

trapezium

at least ______ pair of opposite sides that are parallel
lengths of sides could be the same

rectangle

_____ pairs of opposite sides that are parallel

_____ pairs of sides that are of equal length

_____ right angles

square

_____ pairs of opposite sides that are parallel

_____ sides that are of equal length

_____ right angles

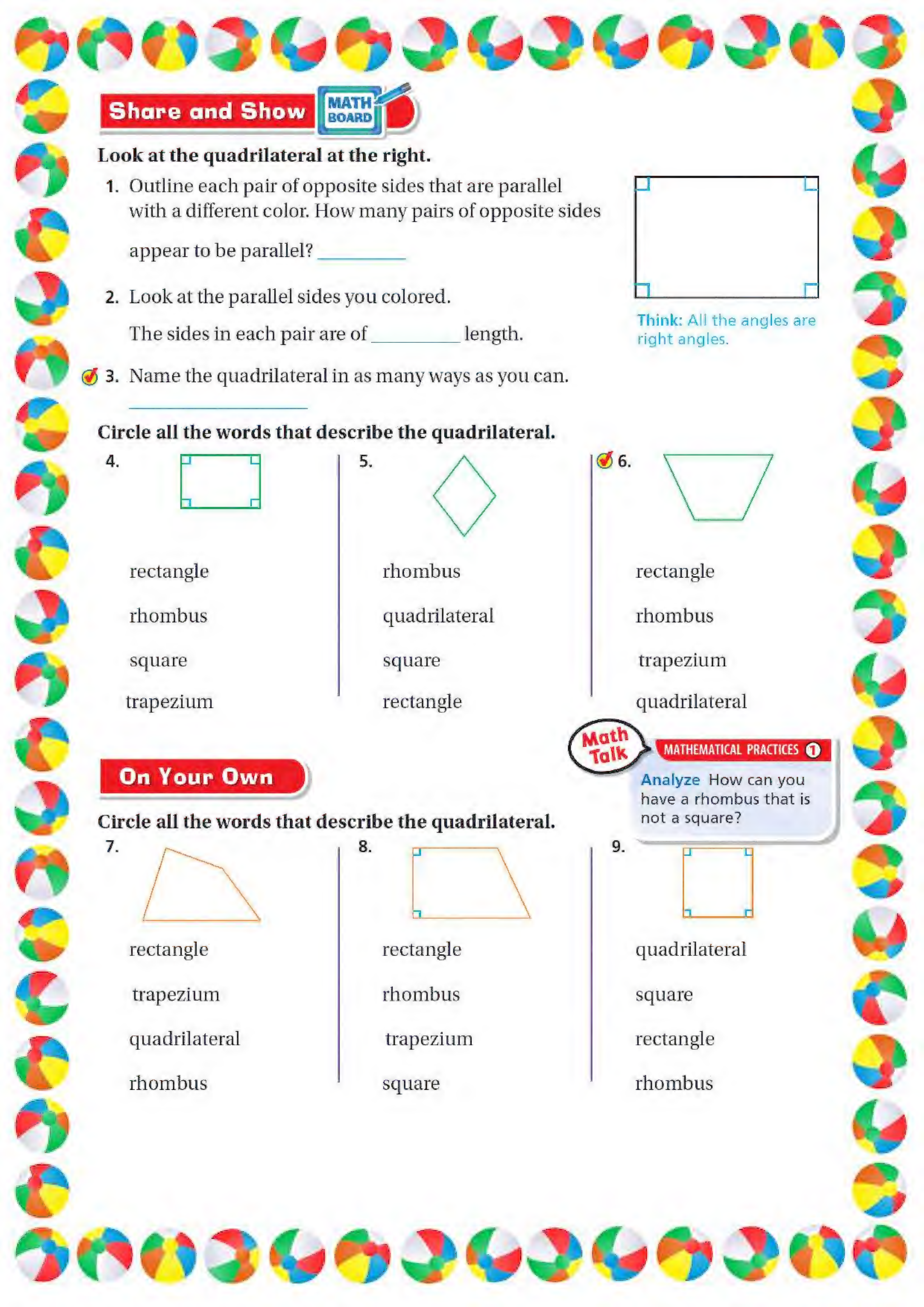
rhombus

_____ pairs of opposite sides that are parallel

_____ sides that are of equal length

Math Talk MATHEMATICAL PRACTICES 8

Generalize Why can a square also be named a rectangle or a rhombus?



Share and Show MATH BOARD

Look at the quadrilateral at the right.

1. Outline each pair of opposite sides that are parallel with a different color. How many pairs of opposite sides appear to be parallel? ________

2. Look at the parallel sides you colored.

   The sides in each pair are of ________ length.

Think: All the angles are right angles.

3. Name the quadrilateral in as many ways as you can.

   ____

Circle all the words that describe the quadrilateral.

4. rectangle, rhombus, square, trapezium

5. rhombus, quadrilateral, square, rectangle

6. rectangle, rhombus, trapezium, quadrilateral

Math Talk — MATHEMATICAL PRACTICES 1

Analyze How can you have a rhombus that is not a square?

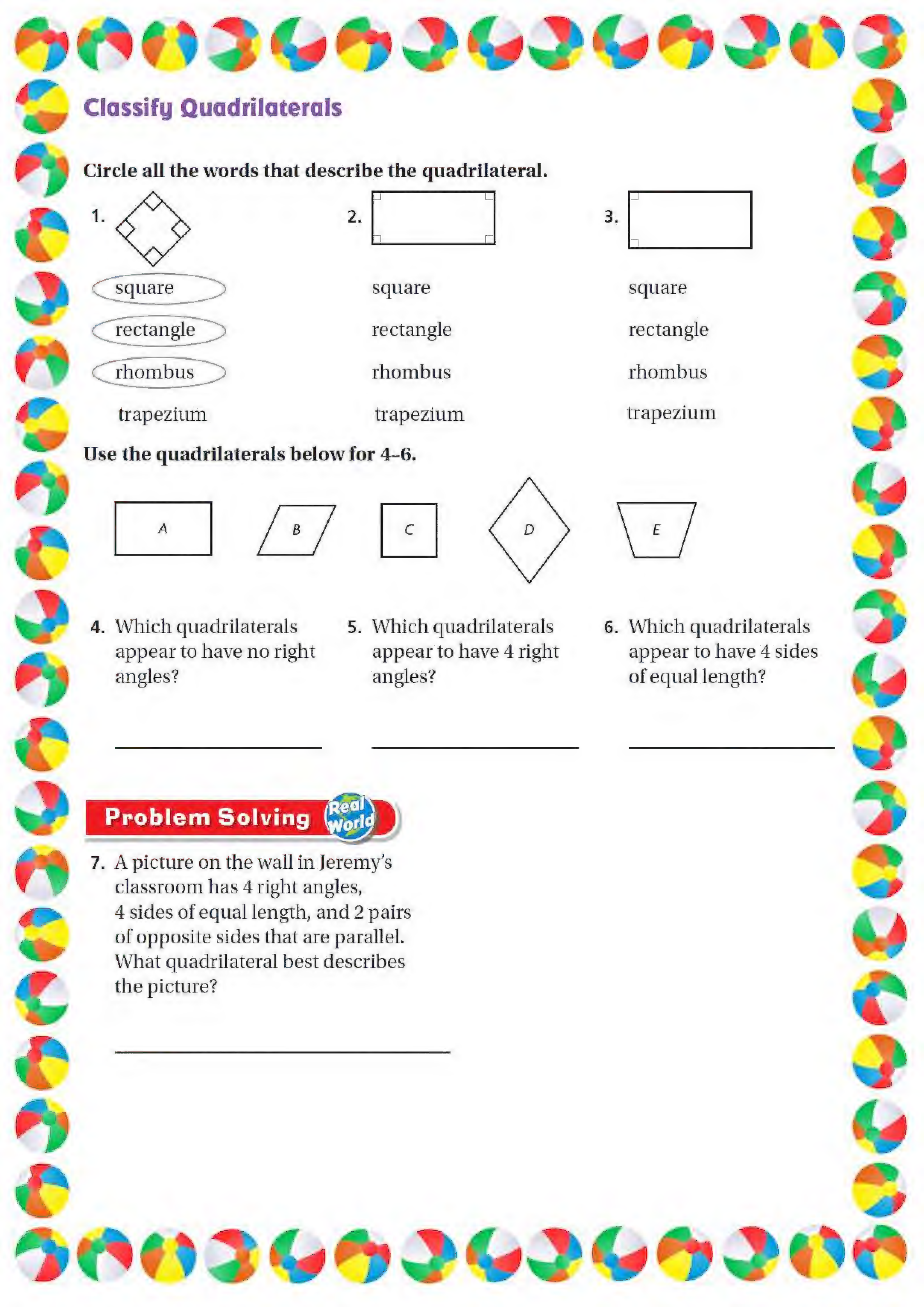
On Your Own

Circle all the words that describe the quadrilateral.

7. rectangle, trapezium, quadrilateral, rhombus

8. rectangle, rhombus, trapezium, square

9. quadrilateral, square, rectangle, rhombus



Classify Quadrilaterals

Circle all the words that describe the quadrilateral.

1. square, rectangle, rhombus, trapezium
2. square, rectangle, rhombus, trapezium
3. square, rectangle, rhombus, trapezium

Use the quadrilaterals below for 4–6.

4. Which quadrilaterals appear to have no right angles?

____

5. Which quadrilaterals appear to have 4 right angles?

____

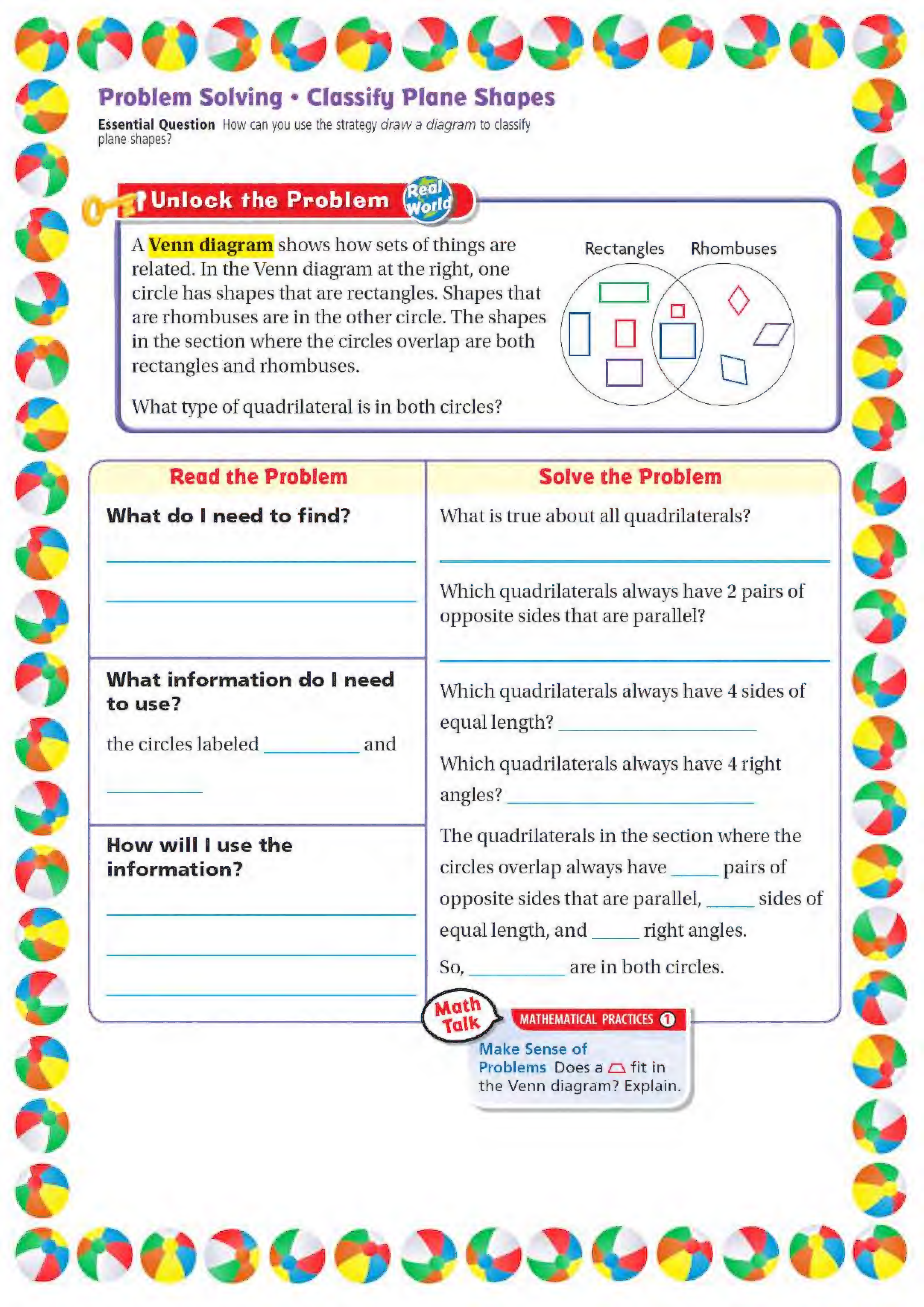
6. Which quadrilaterals appear to have 4 sides of equal length?

____

Problem Solving

7. A picture on the wall in Jeremy's classroom has 4 right angles, 4 sides of equal length, and 2 pairs of opposite sides that are parallel. What quadrilateral best describes the picture?

____



Problem Solving • Classify Plane Shapes

Essential Question How can you use the strategy *draw a diagram* to classify plane shapes?

Unlock the Problem

Real World

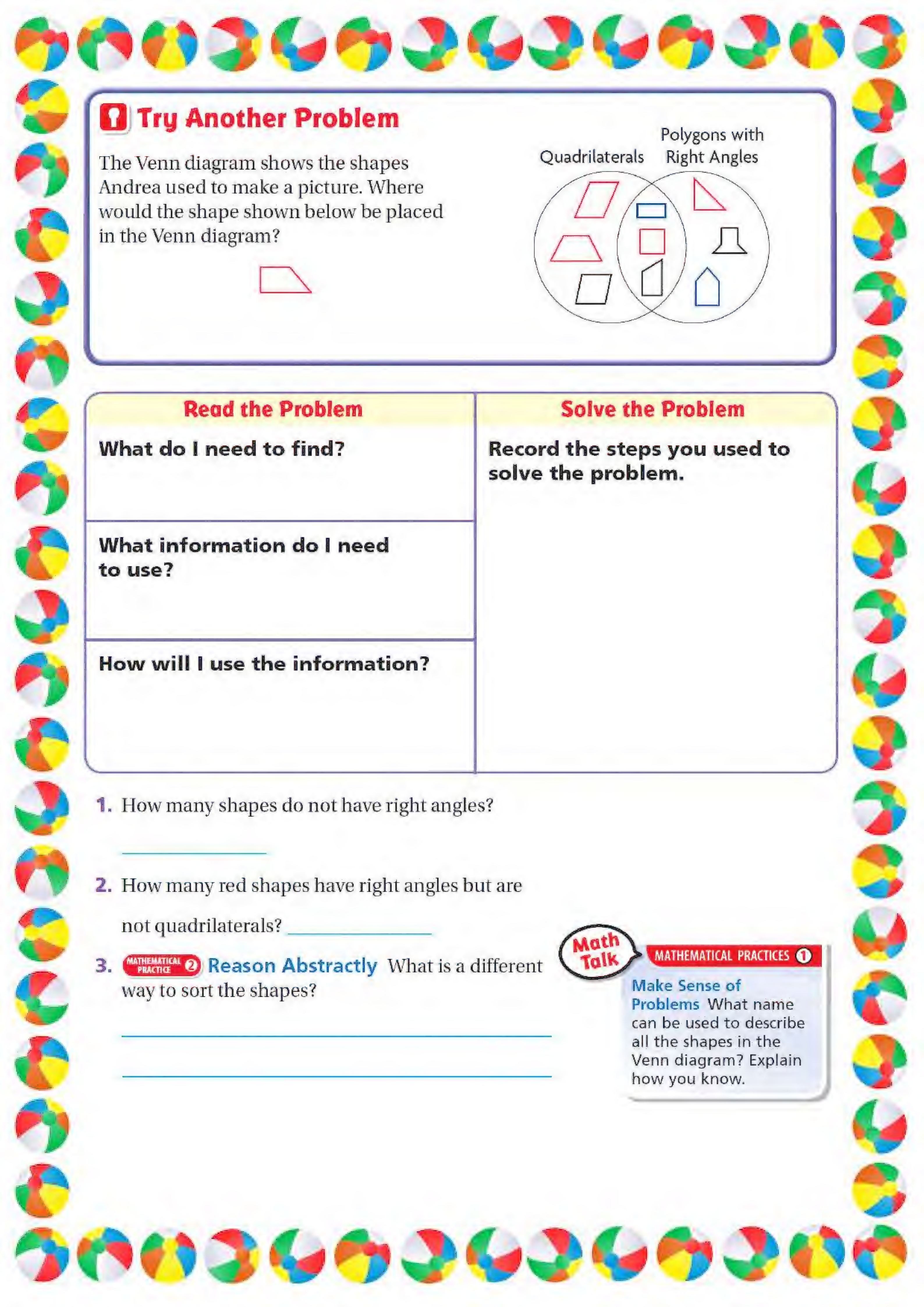
A **Venn diagram** shows how sets of things are related. In the Venn diagram at the right, one circle has shapes that are rectangles. Shapes that are rhombuses are in the other circle. The shapes in the section where the circles overlap are both rectangles and rhombuses.

What type of quadrilateral is in both circles?

Read the Problem	Solve the Problem
What do I need to find? ________________ ________________	What is true about all quadrilaterals? ________________ Which quadrilaterals always have 2 pairs of opposite sides that are parallel? ________________
What information do I need to use? the circles labeled ______ and ______	Which quadrilaterals always have 4 sides of equal length? ________________ Which quadrilaterals always have 4 right angles? ________________
How will I use the information? ________________ ________________ ________________	The quadrilaterals in the section where the circles overlap always have ____ pairs of opposite sides that are parallel, ____ sides of equal length, and ____ right angles. So, ______ are in both circles.

Math Talk MATHEMATICAL PRACTICES 1

Make Sense of Problems Does a ⏢ fit in the Venn diagram? Explain.



Try Another Problem

The Venn diagram shows the shapes Andrea used to make a picture. Where would the shape shown below be placed in the Venn diagram?

Read the Problem	Solve the Problem
What do I need to find?	**Record the steps you used to solve the problem.**
What information do I need to use?	
How will I use the information?	

1. How many shapes do not have right angles?

____

2. How many red shapes have right angles but are not quadrilaterals? ______________

3. MATHEMATICAL PRACTICE 2 **Reason Abstractly** What is a different way to sort the shapes?

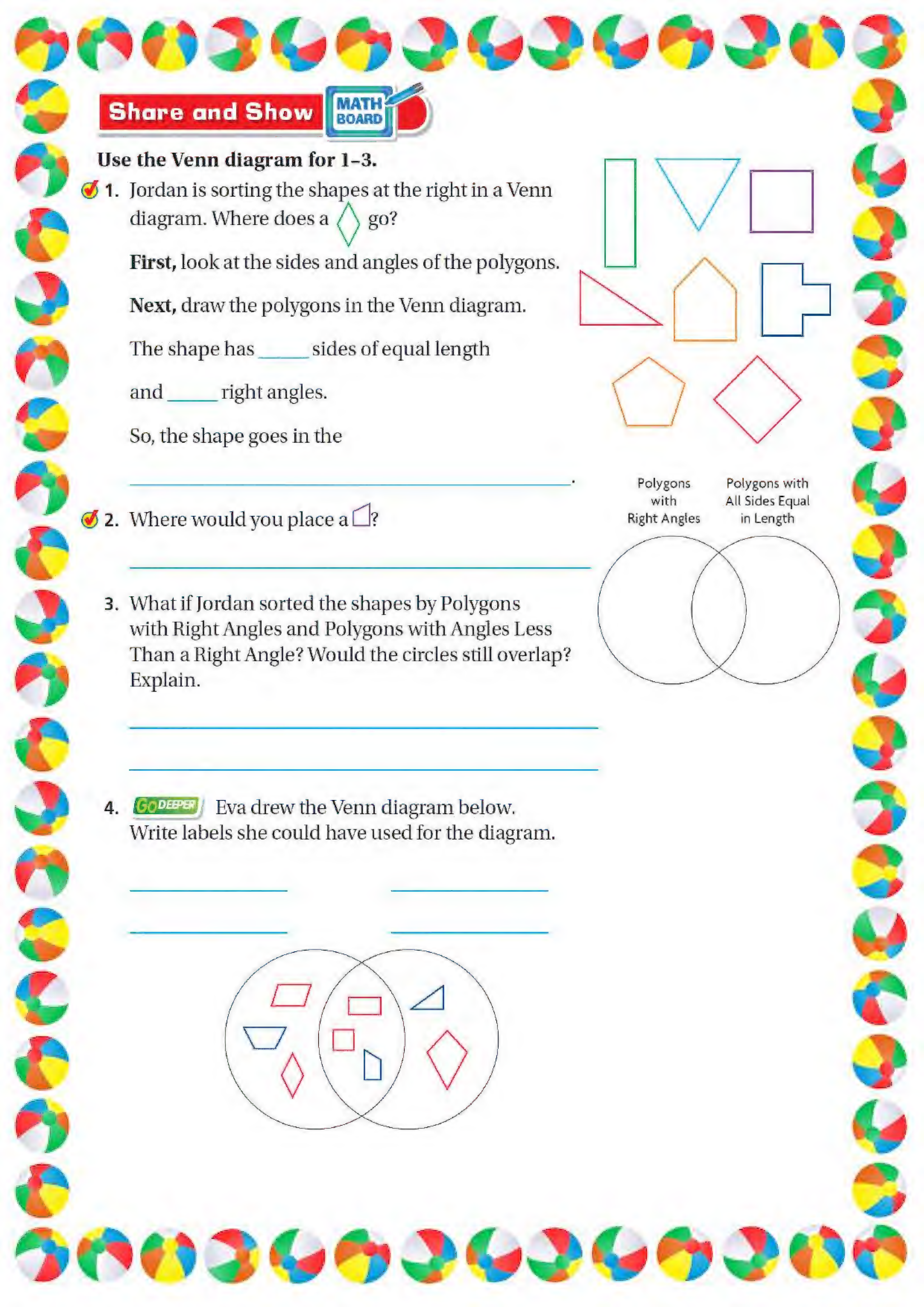
____

____

Math Talk

MATHEMATICAL PRACTICES 1

Make Sense of Problems What name can be used to describe all the shapes in the Venn diagram? Explain how you know.



Share and Show MATH BOARD

Use the Venn diagram for 1–3.

1. Jordan is sorting the shapes at the right in a Venn diagram. Where does a ◇ go?

   First, look at the sides and angles of the polygons.

   Next, draw the polygons in the Venn diagram.

   The shape has _____ sides of equal length

   and _____ right angles.

   So, the shape goes in the

   ____.

2. Where would you place a ⏢?

   ____

3. What if Jordan sorted the shapes by Polygons with Right Angles and Polygons with Angles Less Than a Right Angle? Would the circles still overlap? Explain.

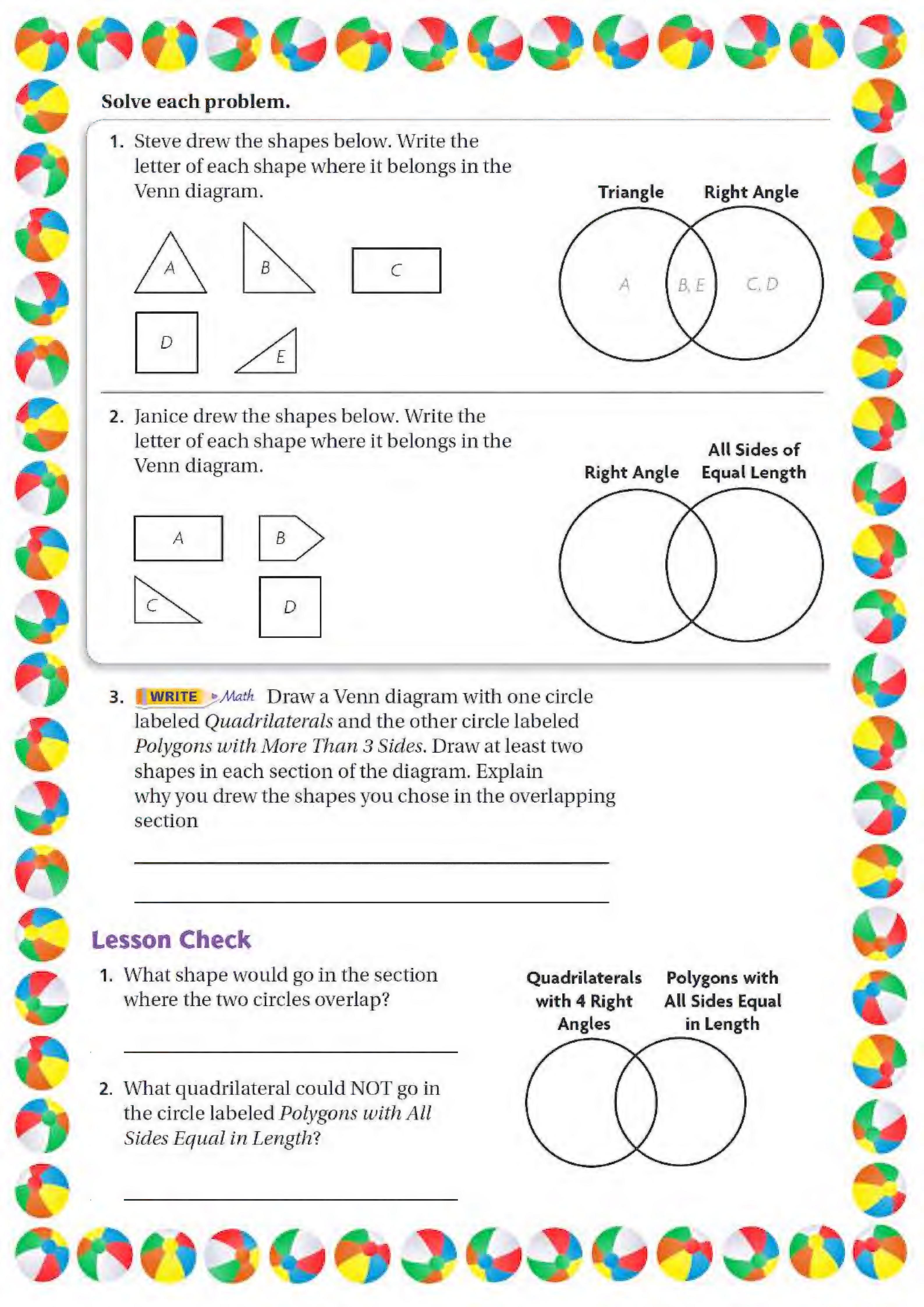
   ____

   ____

4. GO DEEPER Eva drew the Venn diagram below. Write labels she could have used for the diagram.

   ____________________ ____________________

   ____________________ ____________________



Solve each problem.

1. Steve drew the shapes below. Write the letter of each shape where it belongs in the Venn diagram.

2. Janice drew the shapes below. Write the letter of each shape where it belongs in the Venn diagram.

3. **WRITE** ▸ *Math* Draw a Venn diagram with one circle labeled *Quadrilaterals* and the other circle labeled *Polygons with More Than 3 Sides*. Draw at least two shapes in each section of the diagram. Explain why you drew the shapes you chose in the overlapping section

____

____

Lesson Check

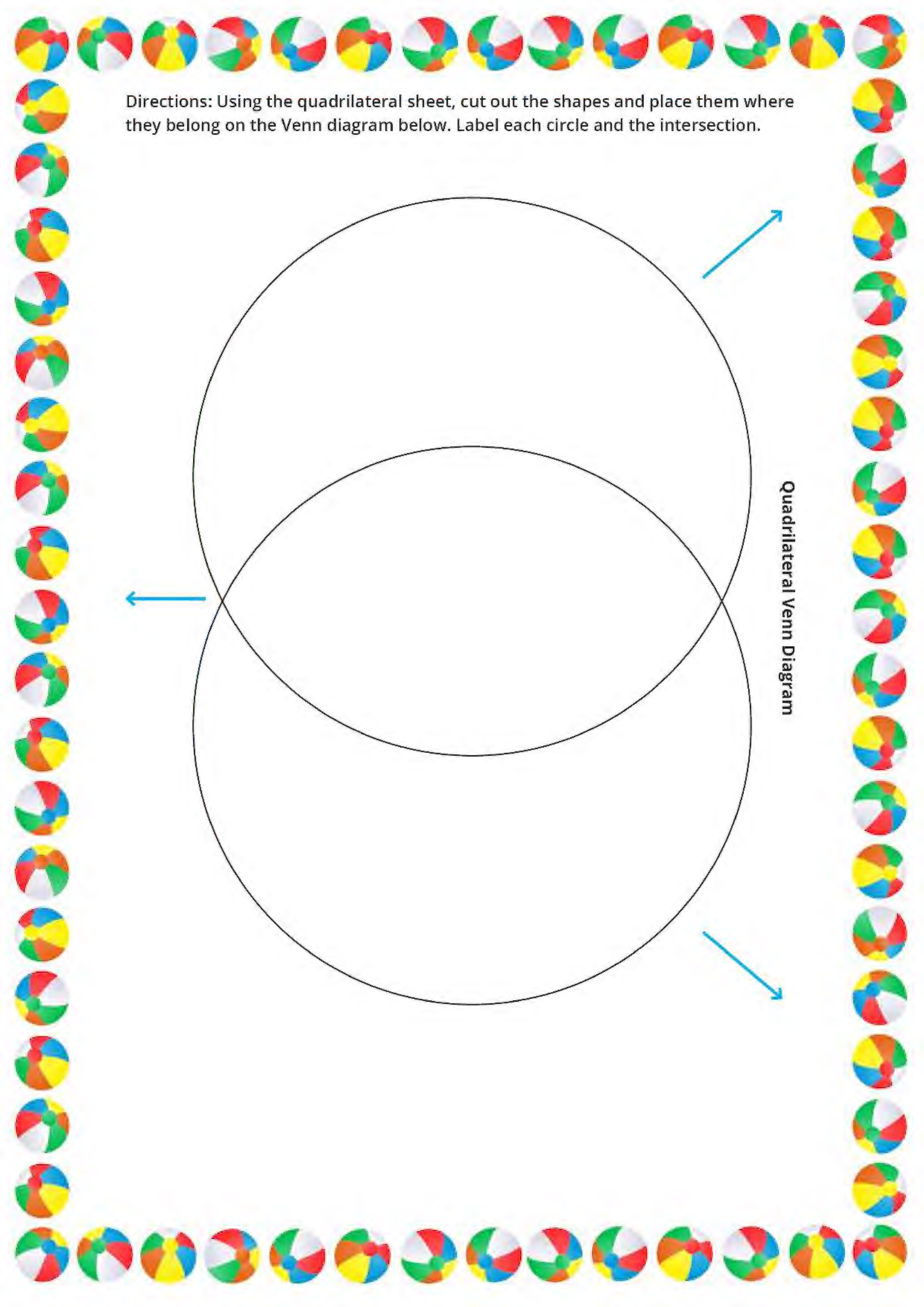
1. What shape would go in the section where the two circles overlap?

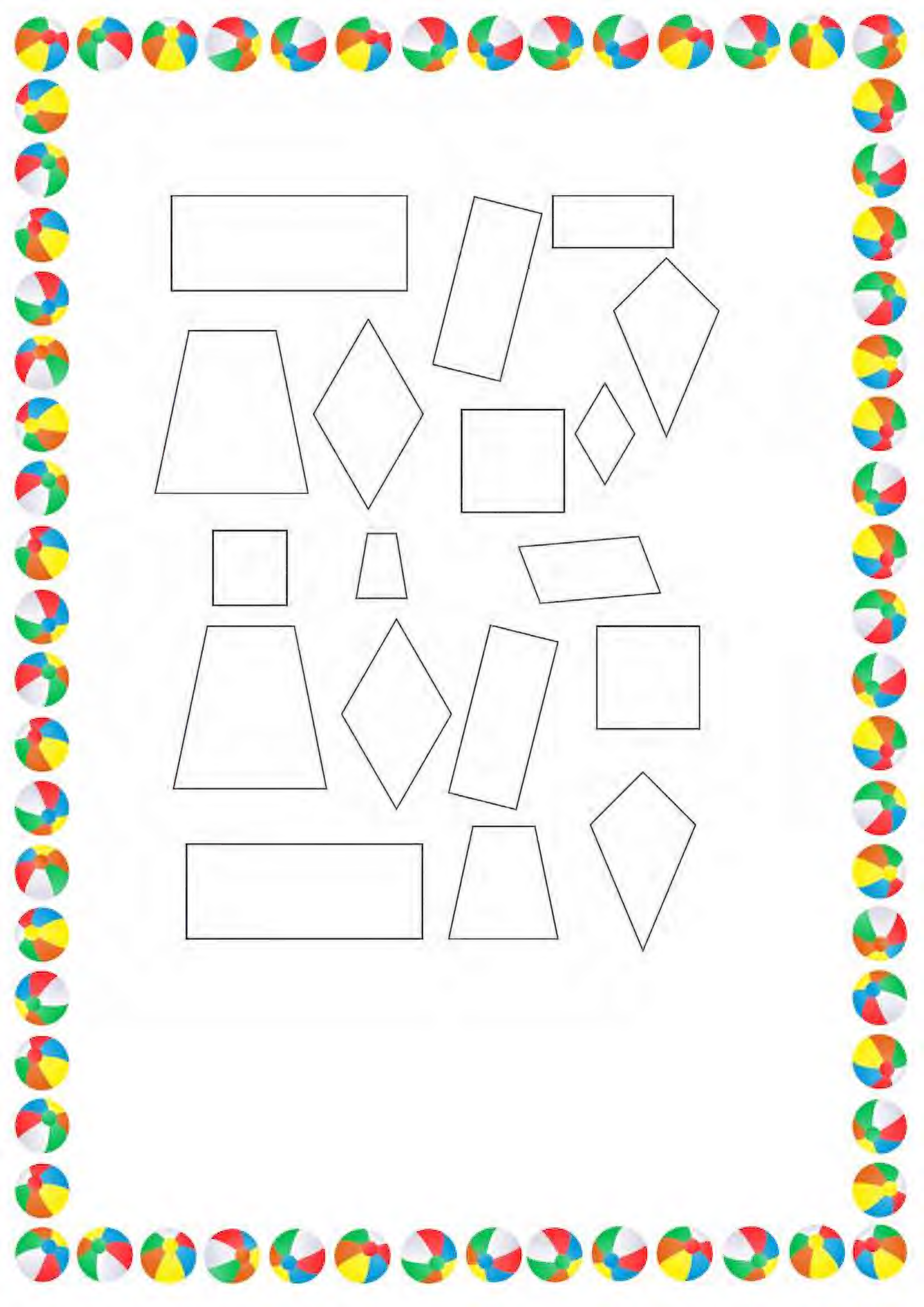
____

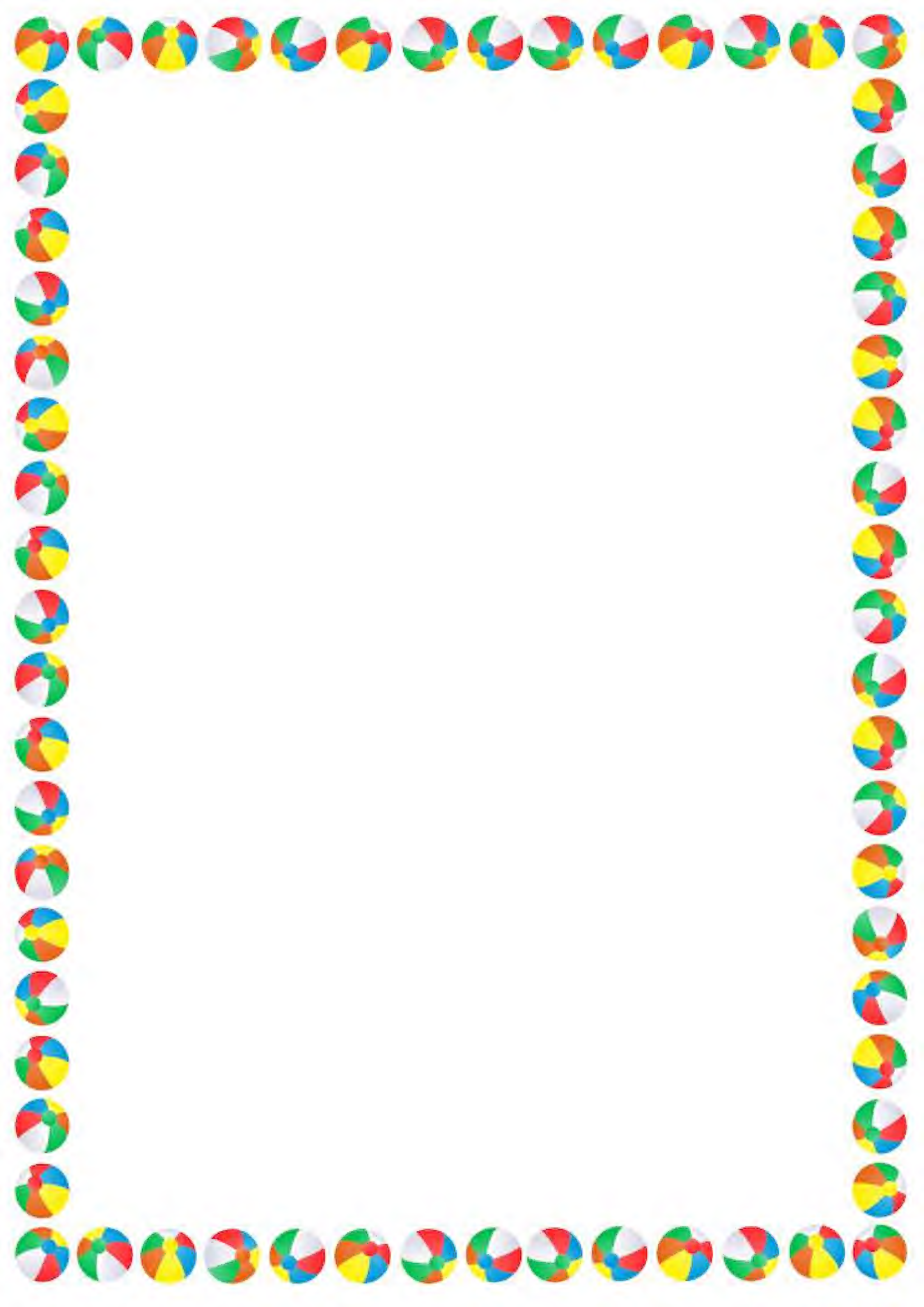
2. What quadrilateral could NOT go in the circle labeled *Polygons with All Sides Equal in Length*?

____

Directions: Using the quadrilateral sheet, cut out the shapes and place them where they belong on the Venn diagram below. Label each circle and the intersection.





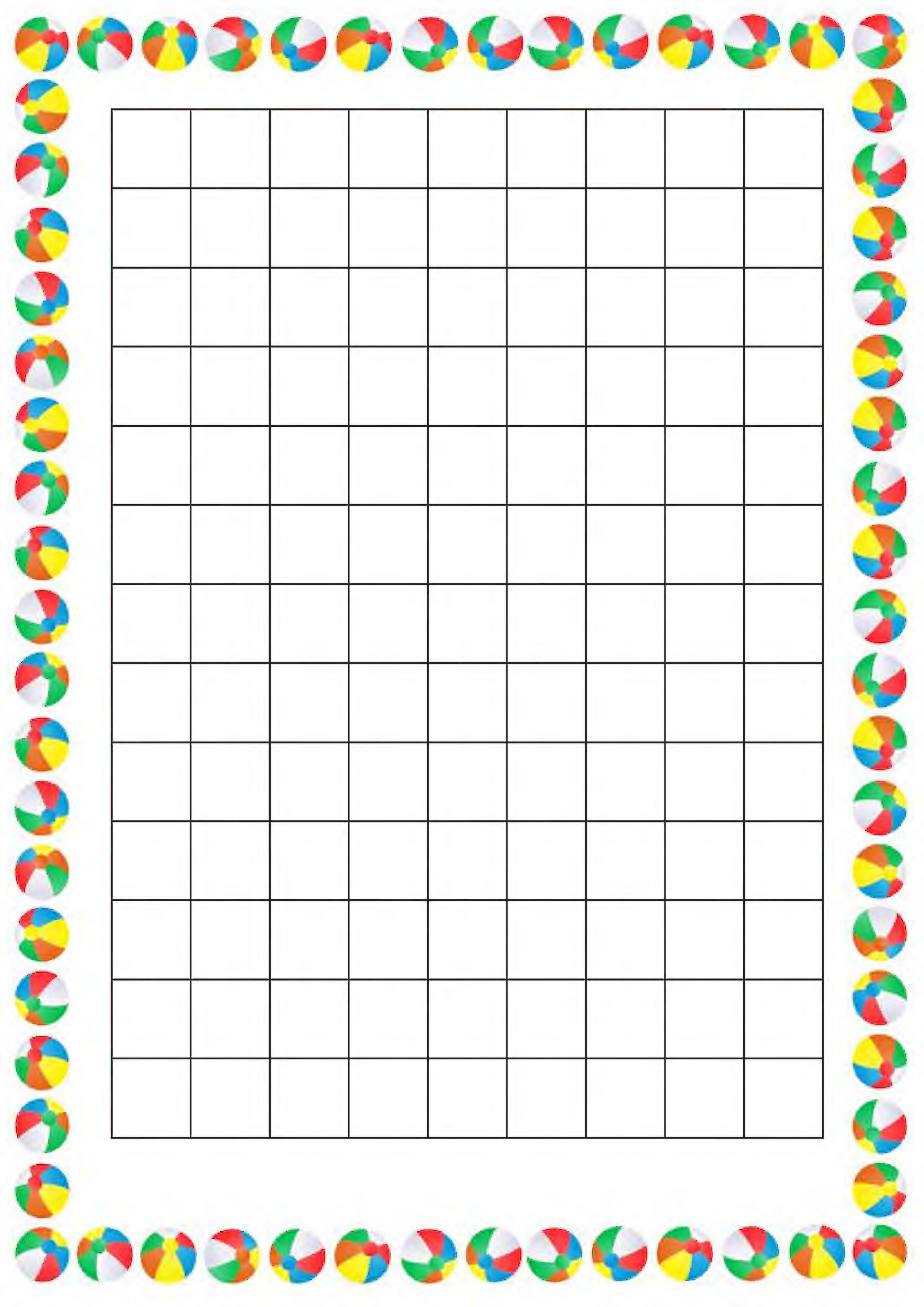


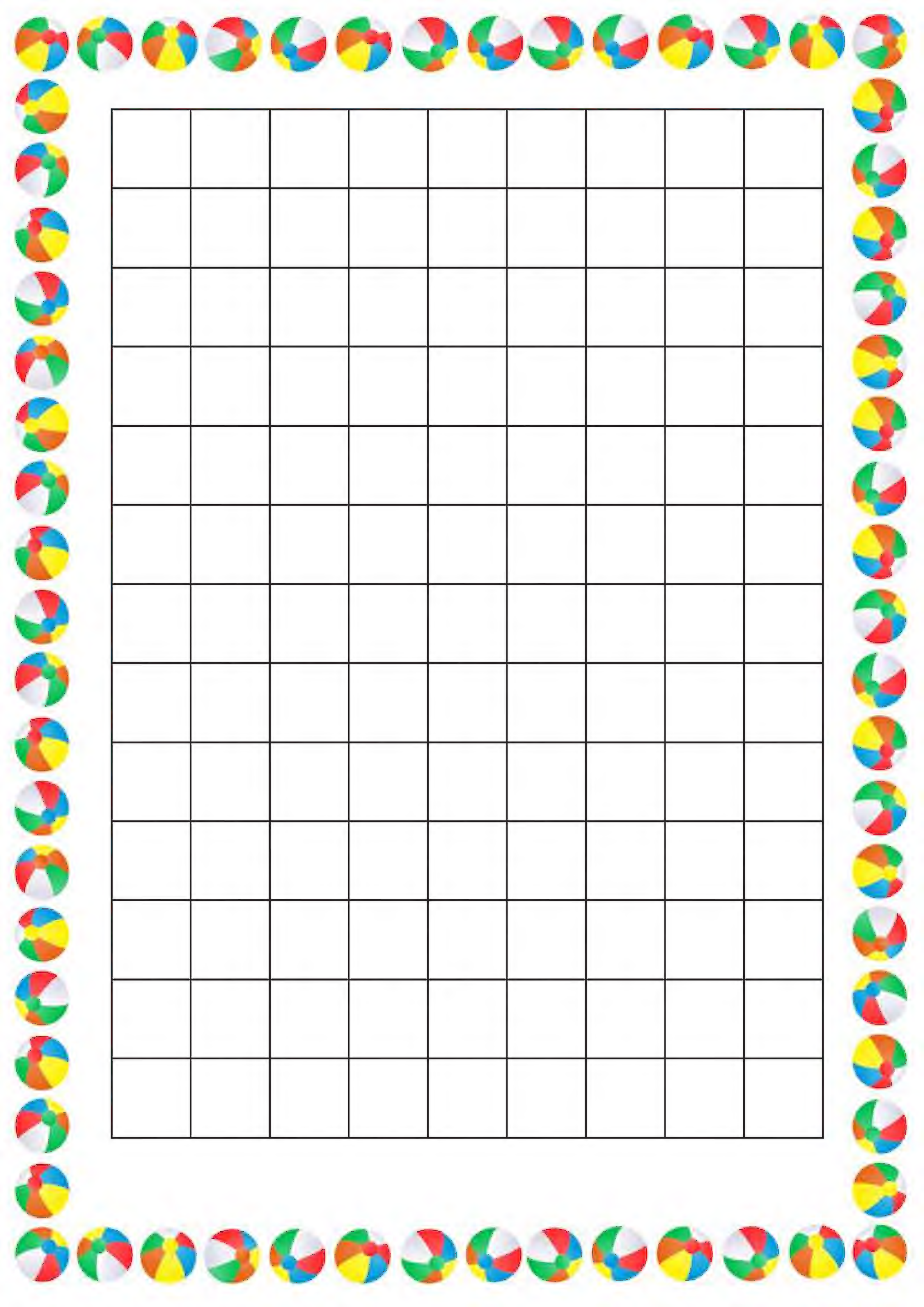


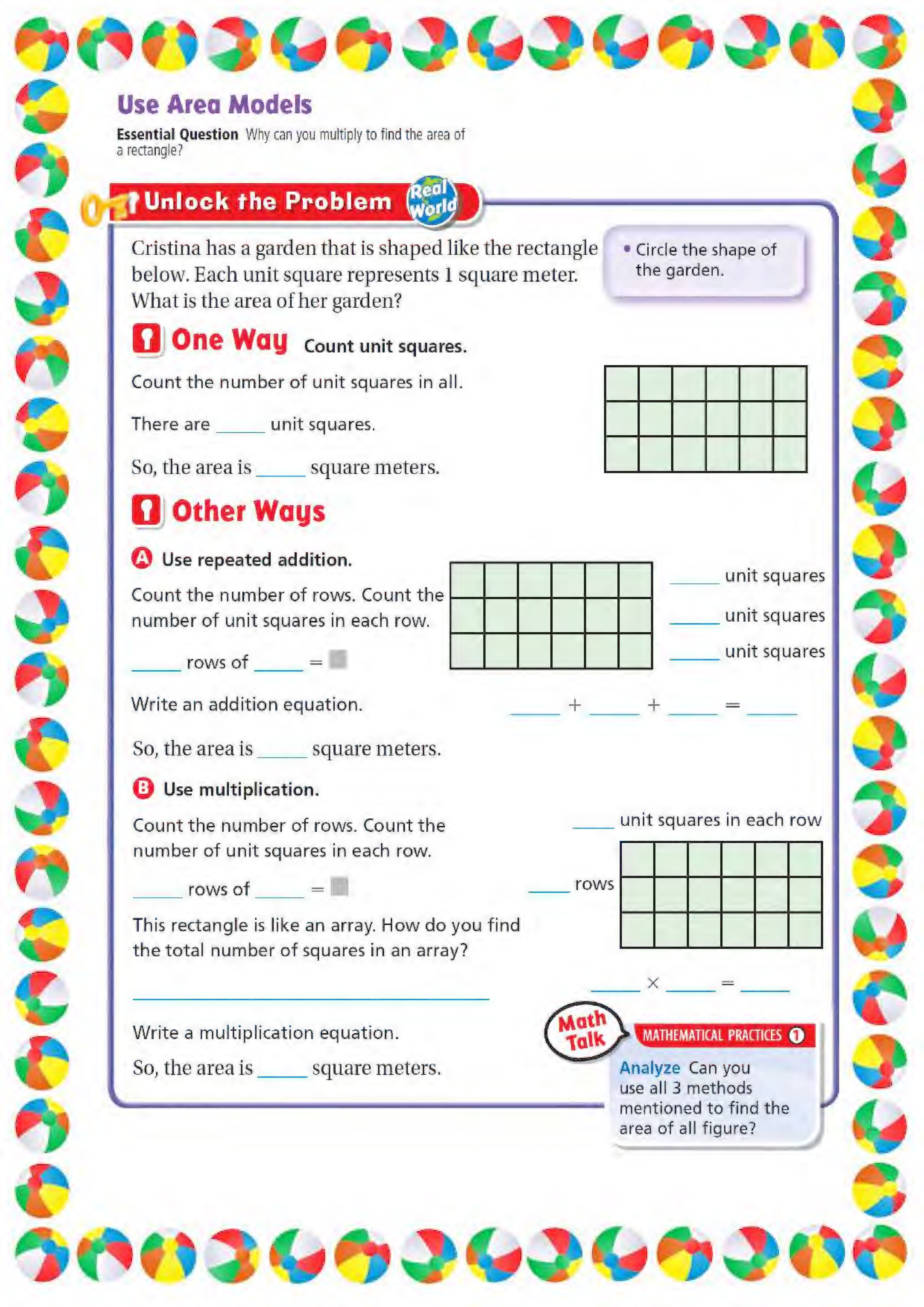
Directions: Follow the steps below.

1. Read the problem and then build the garden plot using the small squares.
2. Draw the garden plot on the grid paper. (Hint: You can place your squares on the grid to help you draw the outlines of the garden plot.)
3. Find the total area of the garden plot (array).
4. Repeat for all garden plots.

GARDEN PLOT PROBLEMS	ANSWERS
Garden Plot #1: Jana is planting squash. Each squash needs 1 square unit of space. She would like the garden to have 2 rows with 9 square units in each row. How many squash can she fit? What is the area of her garden in square units?	
Garden Plot #2: Omar wants to plant corn. Corn needs 1 square unit of space. He would like the garden to have 3 rows with 7 square units in each row. How much corn can Omar fit in his garden? What is the area of his garden in square units?	
Garden Plot #3: Youssef loves watermelon and wants to plant it in his garden. Watermelon needs 1 square unit of space. He would like the garden to have 4 rows with 4 square units in each row. How many watermelons can Youssef fit in his garden? What is the area of his garden in square units?	
Garden Plot #4: Nadia wants to plant zucchini. Zucchini needs 1 square unit of space. She would like the garden to have 3 rows with 4 square units in each row. How much zucchini can Nadia fit in her garden? What is the area of her garden in square units?	
Garden Plot #5: Aya wants to plant lettuce. Lettuce needs 1 square unit of space. She would like the garden to have 5 rows with 8 square units in each row. How much lettuce can Aya fit in her garden? What is the area of her garden in square units?	







Use Area Models

Essential Question Why can you multiply to find the area of a rectangle?

Unlock the Problem Real World

Cristina has a garden that is shaped like the rectangle below. Each unit square represents 1 square meter. What is the area of her garden?

- Circle the shape of the garden.

One Way Count unit squares.

Count the number of unit squares in all.

There are _____ unit squares.

So, the area is _____ square meters.

Other Ways

A Use repeated addition.

Count the number of rows. Count the number of unit squares in each row.

_____ unit squares

_____ unit squares

_____ unit squares

_____ rows of _____ = ▪

Write an addition equation. _____ + _____ + _____ = _____

So, the area is _____ square meters.

B Use multiplication.

Count the number of rows. Count the number of unit squares in each row.

_____ unit squares in each row

_____ rows

_____ rows of _____ = ▪

This rectangle is like an array. How do you find the total number of squares in an array?

____

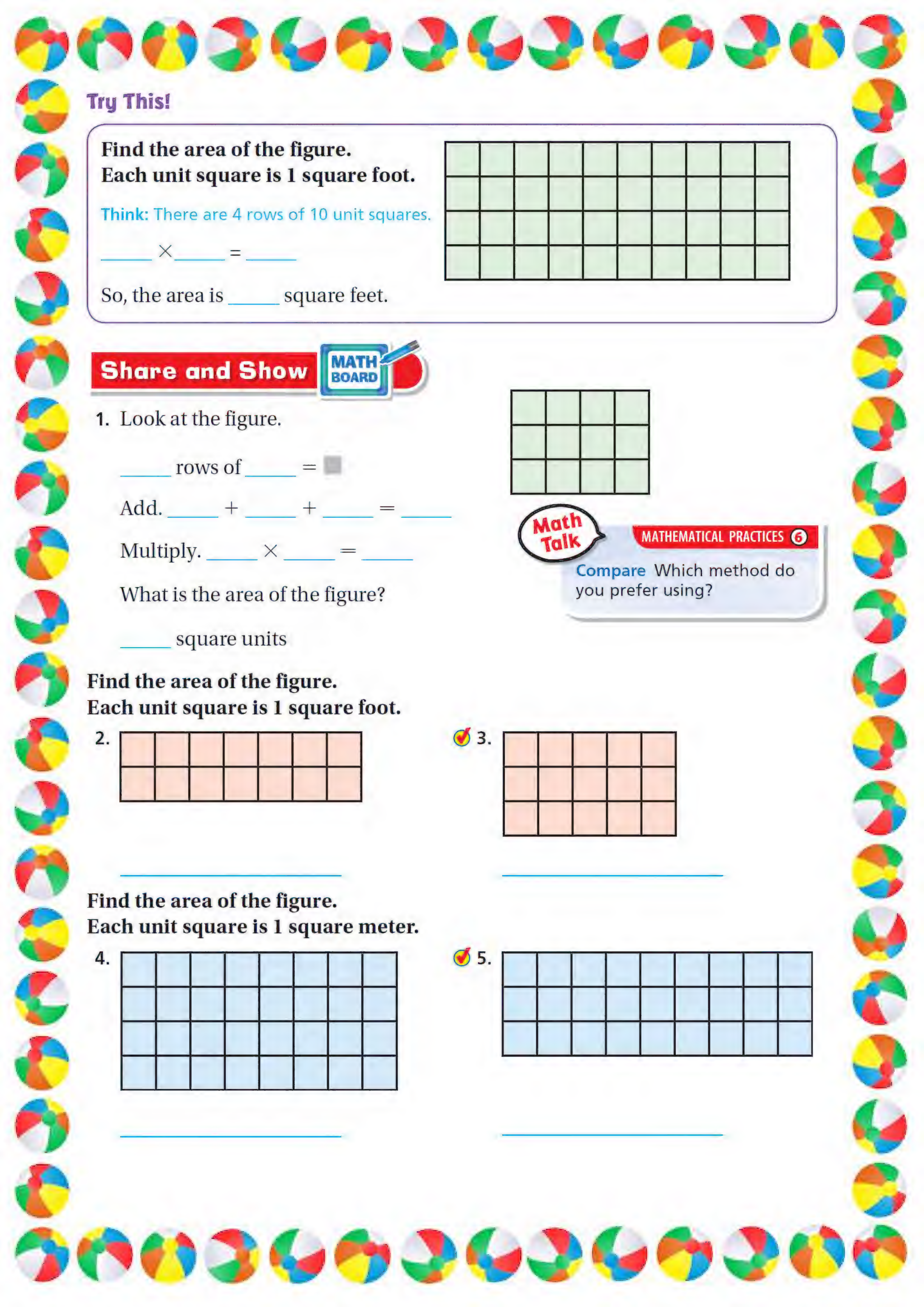
_____ × _____ = _____

Write a multiplication equation.

So, the area is _____ square meters.

Math Talk MATHEMATICAL PRACTICES 1

Analyze Can you use all 3 methods mentioned to find the area of all figure?



Try This!

Find the area of the figure.
Each unit square is 1 square foot.

Think: There are 4 rows of 10 unit squares.

_____ × _____ = _____

So, the area is _____ square feet.

Share and Show

MATH BOARD

1. Look at the figure.

_____ rows of _____ = ▢

Add. _____ + _____ + _____ = _____

Multiply. _____ × _____ = _____

What is the area of the figure?

_____ square units

Math Talk

MATHEMATICAL PRACTICES 6

Compare Which method do you prefer using?

Find the area of the figure.
Each unit square is 1 square foot.

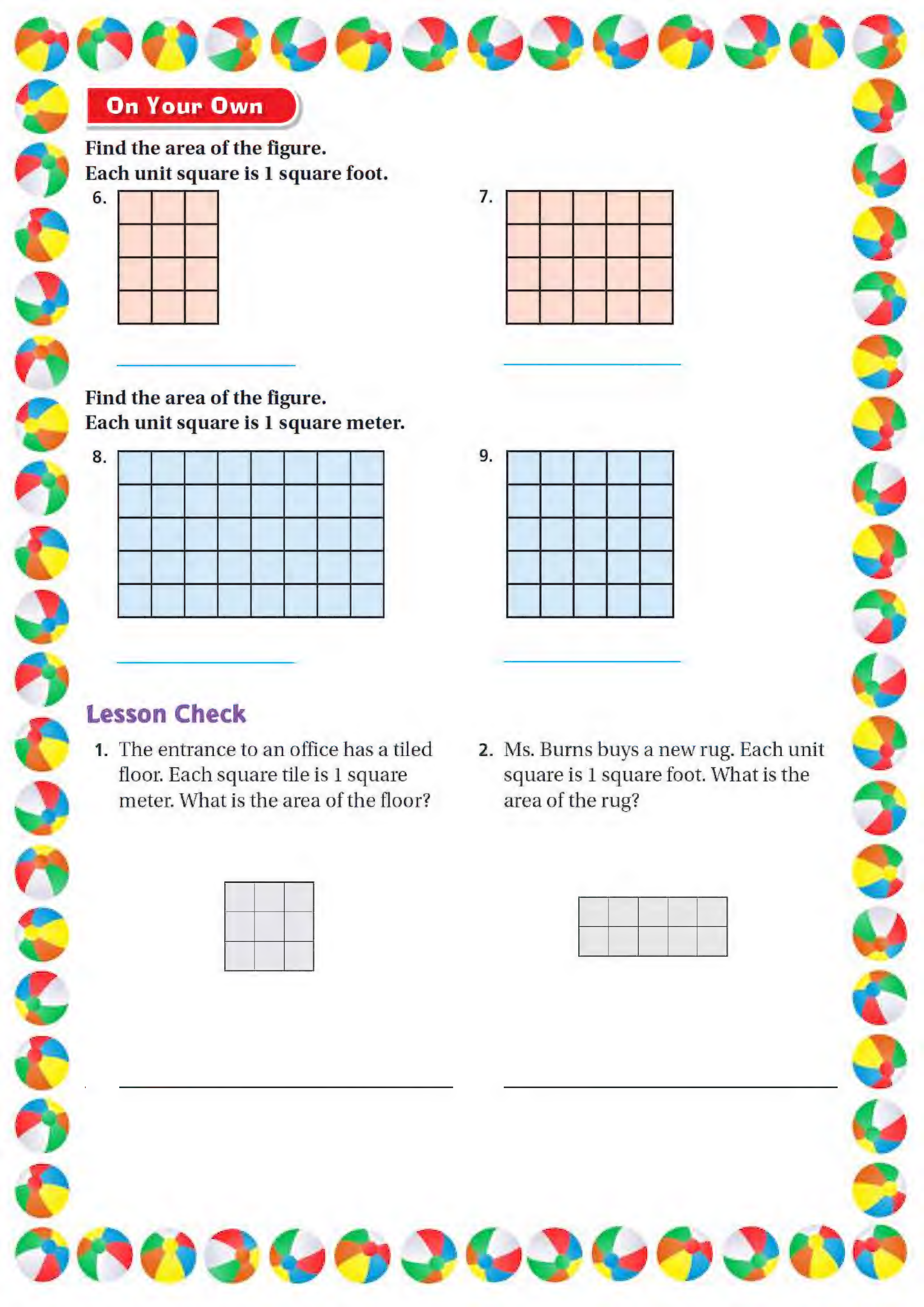
2. _______________

3. _______________

Find the area of the figure.
Each unit square is 1 square meter.

4. _______________

5. _______________



On Your Own

Find the area of the figure.
Each unit square is 1 square foot.

6.

7.

Find the area of the figure.
Each unit square is 1 square meter.

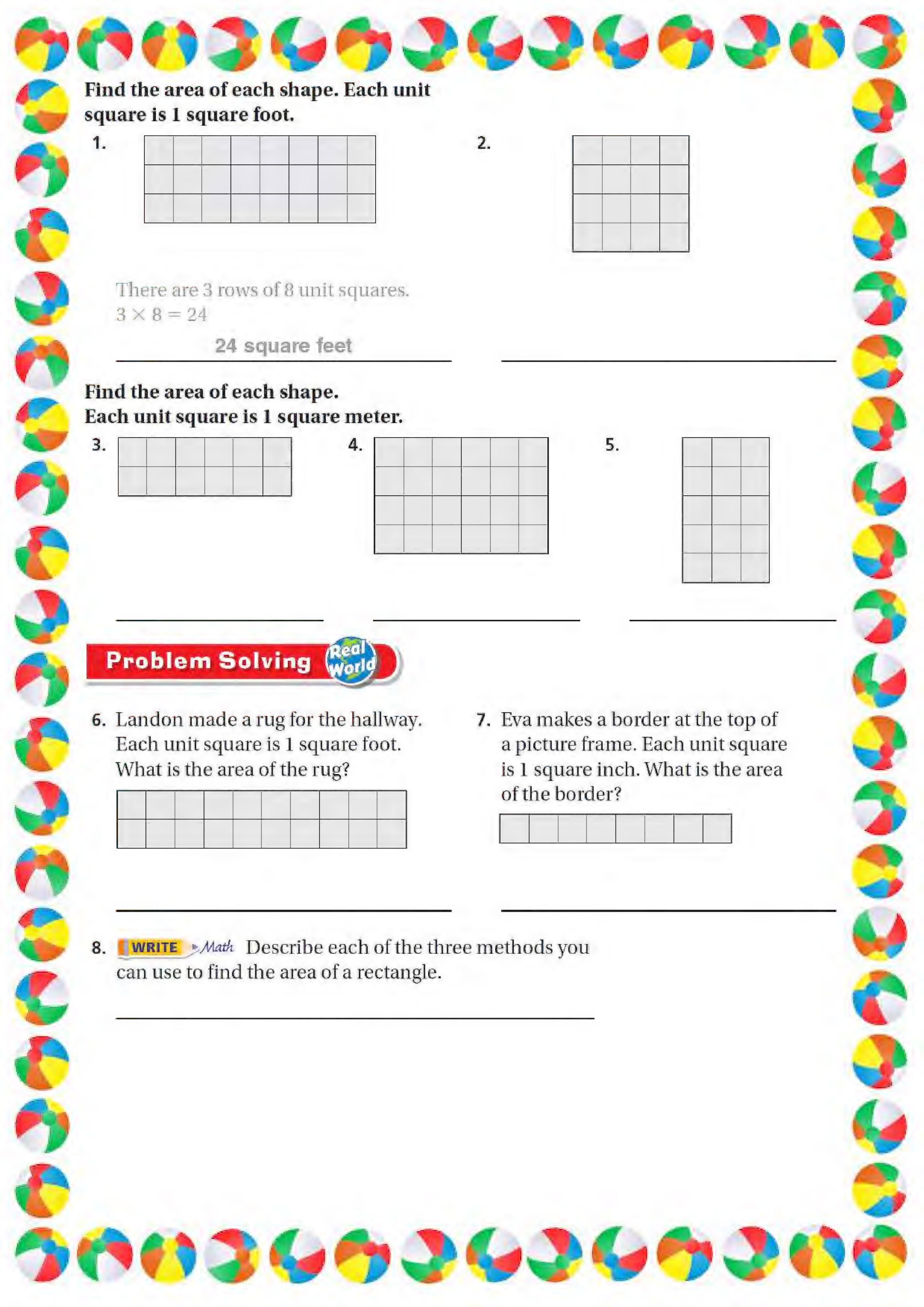
8.

9.

Lesson Check

1. The entrance to an office has a tiled floor. Each square tile is 1 square meter. What is the area of the floor?

2. Ms. Burns buys a new rug. Each unit square is 1 square foot. What is the area of the rug?



Find the area of each shape. Each unit square is 1 square foot.

1\. There are 3 rows of 8 unit squares.
$3 \times 8 = 24$

24 square feet

2\.

Find the area of each shape.
Each unit square is 1 square meter.

3\.

4\.

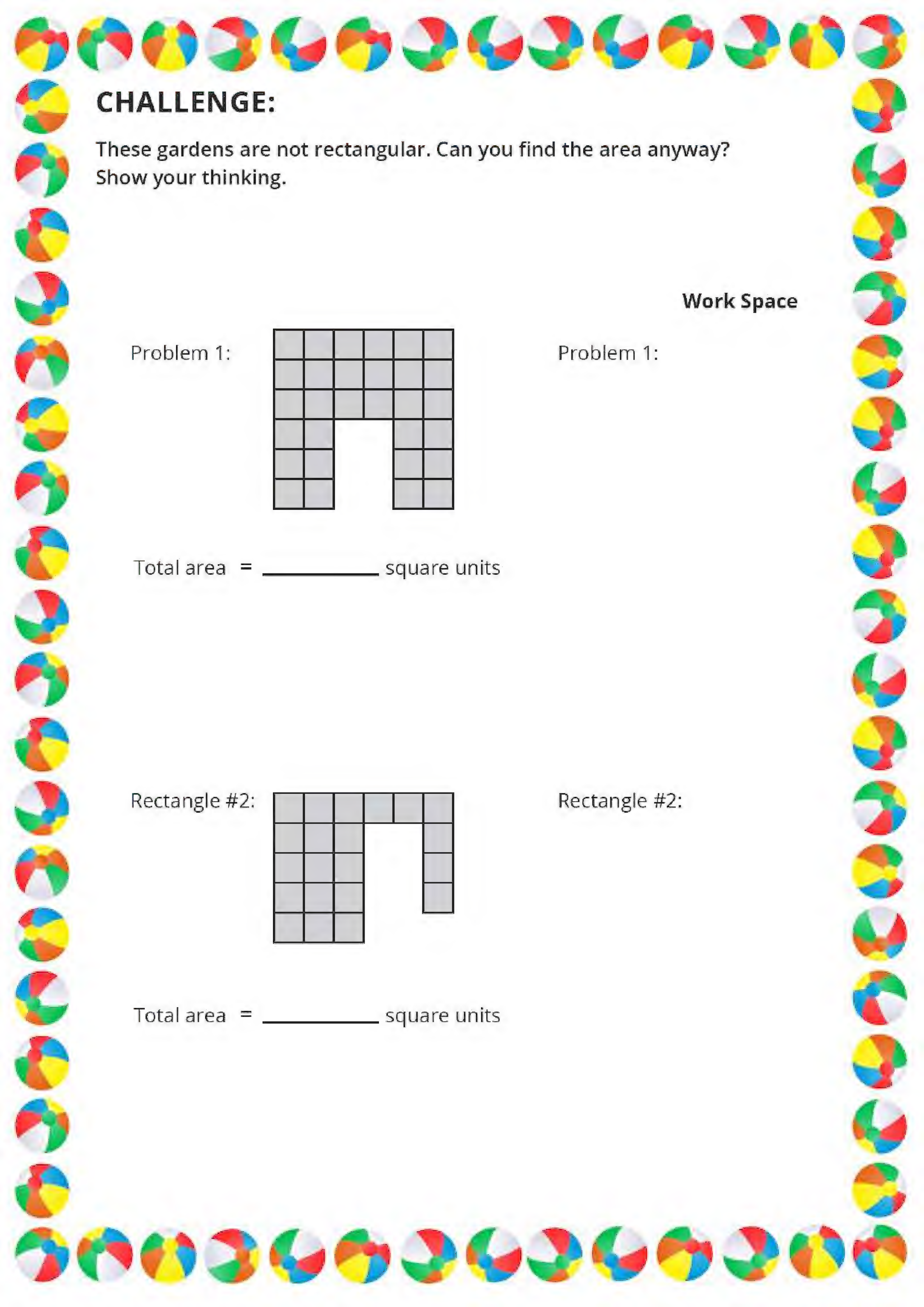
5\.

Problem Solving Real World

6\. Landon made a rug for the hallway. Each unit square is 1 square foot. What is the area of the rug?

7\. Eva makes a border at the top of a picture frame. Each unit square is 1 square inch. What is the area of the border?

8\. WRITE Math Describe each of the three methods you can use to find the area of a rectangle.



CHALLENGE:

These gardens are not rectangular. Can you find the area anyway?
Show your thinking.

Work Space

Problem 1:

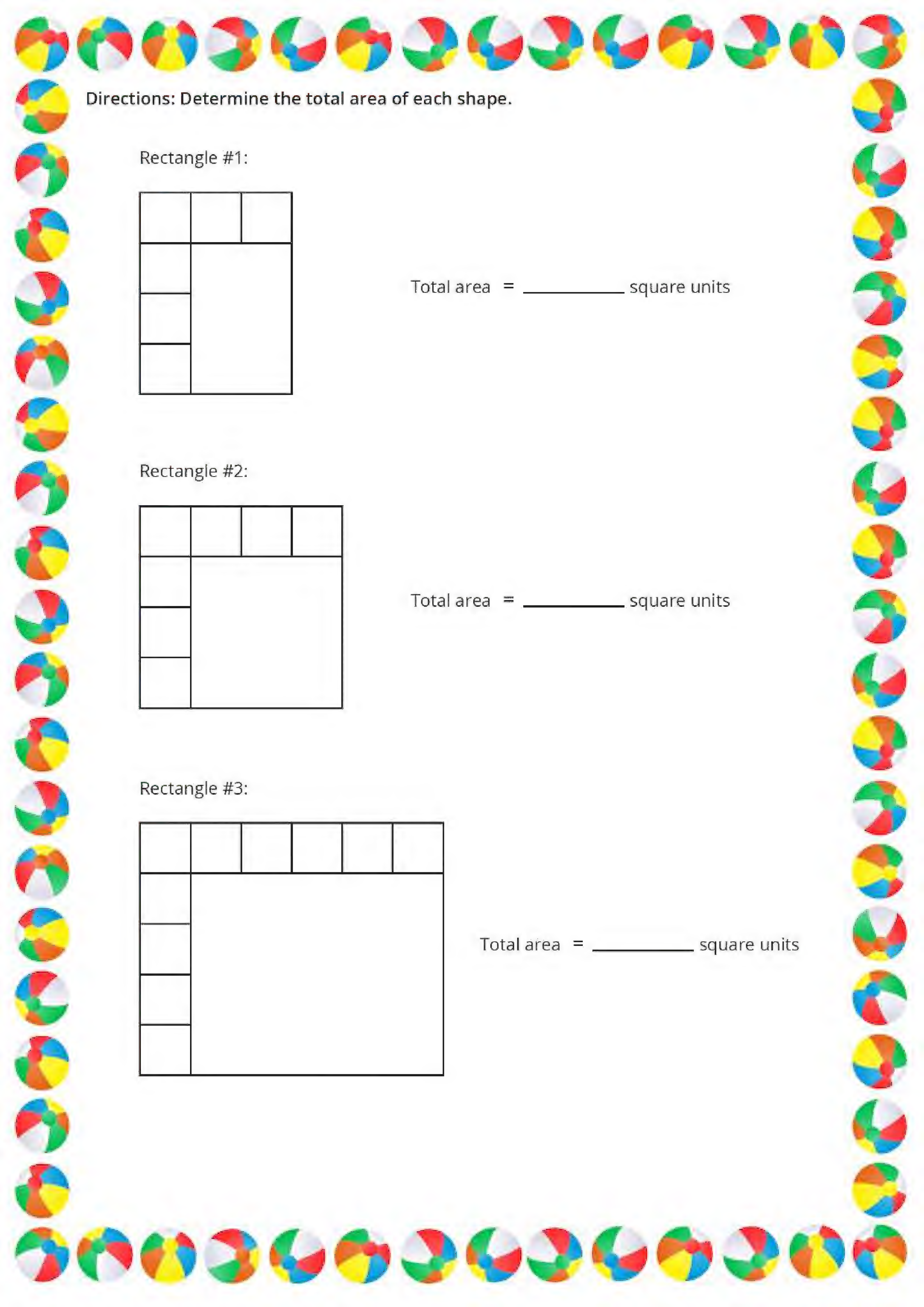
Total area = ____________ square units

Problem 1:

Rectangle #2:

Total area = ____________ square units

Rectangle #2:



Directions: Determine the total area of each shape.

Rectangle #1:

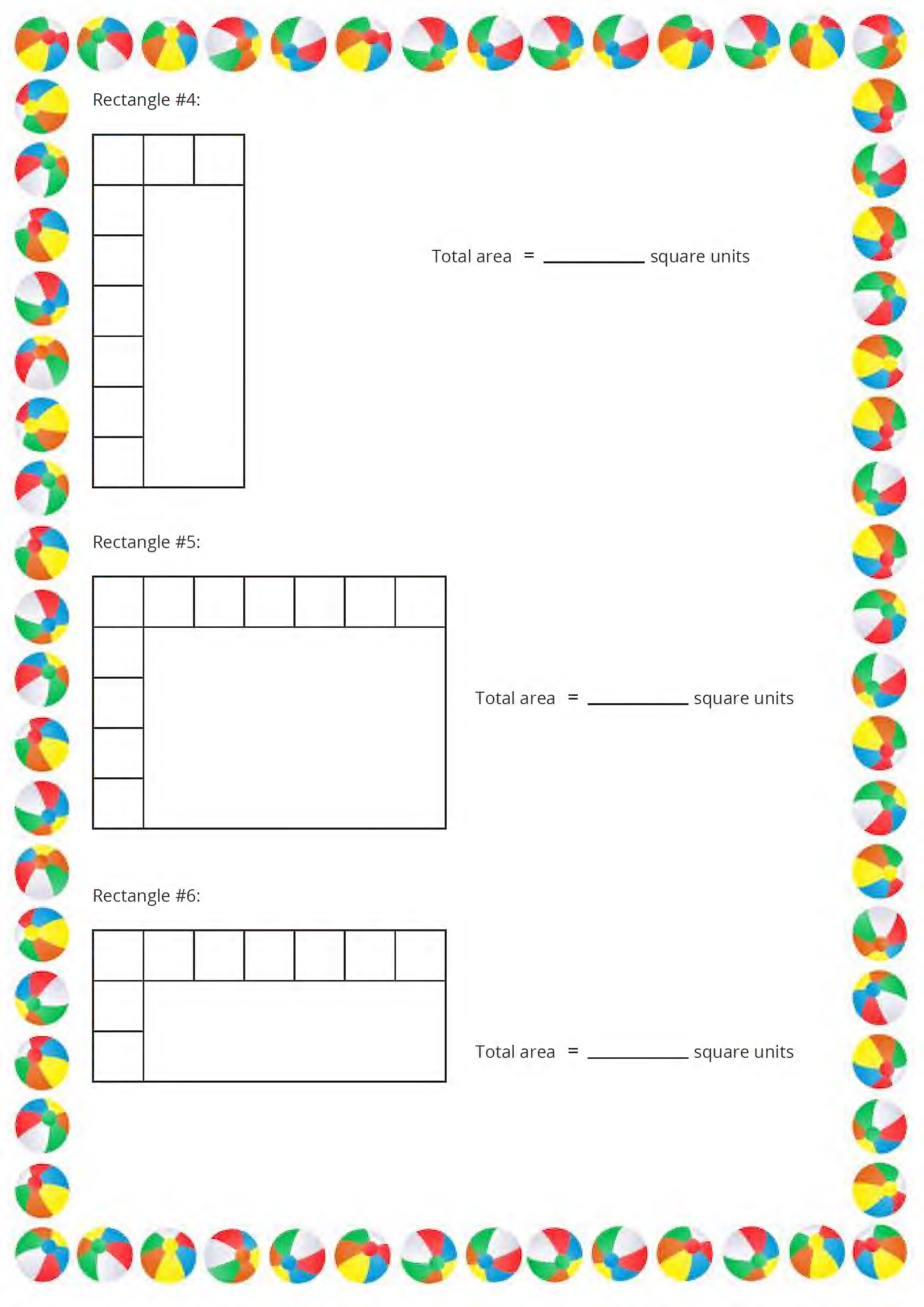
Total area = __________ square units

Rectangle #2:

Total area = __________ square units

Rectangle #3:

Total area = __________ square units



Rectangle #4:

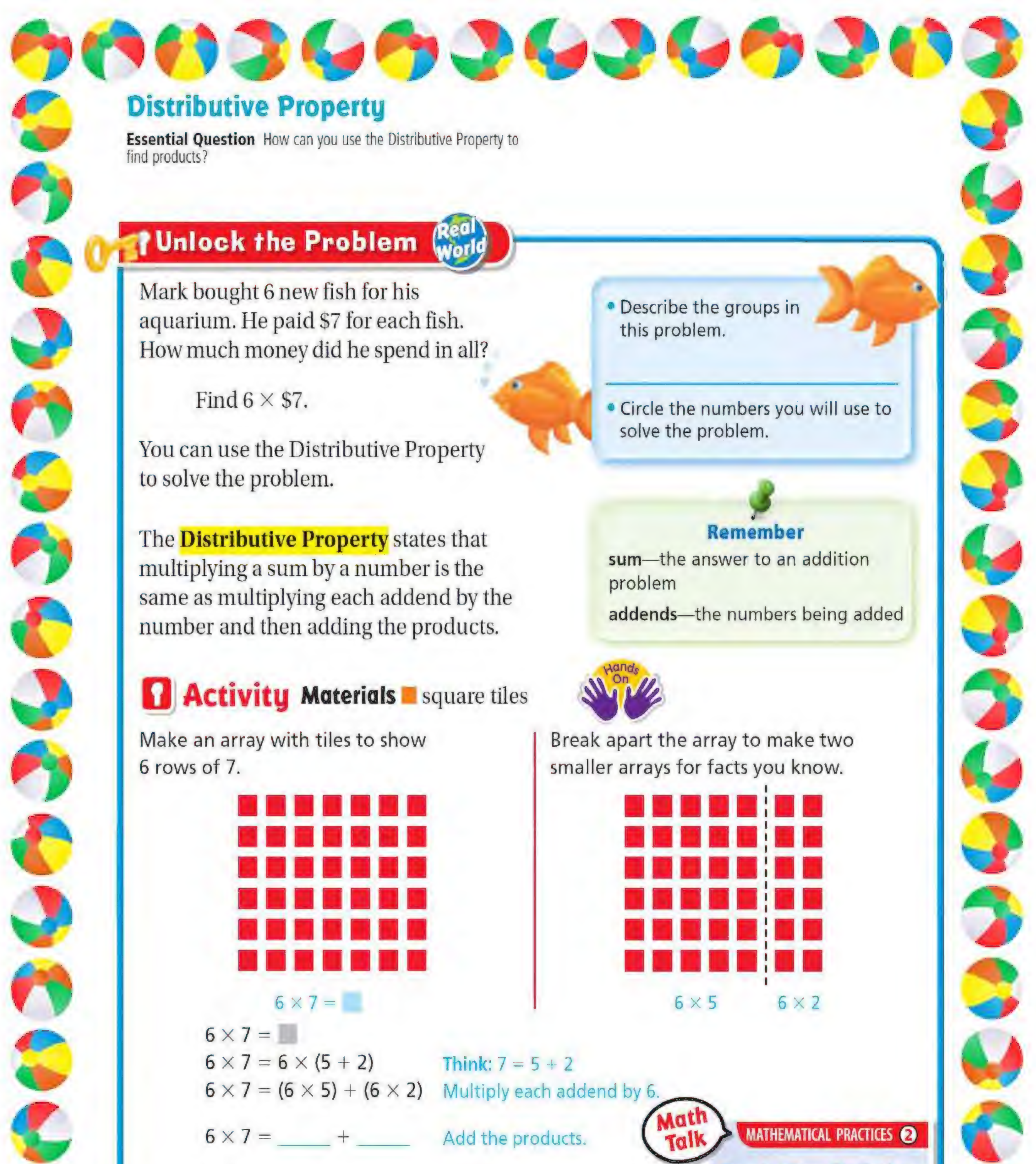
Total area = ________ square units

Rectangle #5:

Total area = ________ square units

Rectangle #6:

Total area = ________ square units



Distributive Property

Essential Question How can you use the Distributive Property to find products?

Unlock the Problem — Real World

Mark bought 6 new fish for his aquarium. He paid $7 for each fish. How much money did he spend in all?

Find 6 × $7.

You can use the Distributive Property to solve the problem.

The **Distributive Property** states that multiplying a sum by a number is the same as multiplying each addend by the number and then adding the products.

- Describe the groups in this problem.

- Circle the numbers you will use to solve the problem.

Remember

sum—the answer to an addition problem

addends—the numbers being added

Activity Materials ■ square tiles

Hands On

Make an array with tiles to show 6 rows of 7.

$6 \times 7 = \square$

Break apart the array to make two smaller arrays for facts you know.

6×5 6×2

$6 \times 7 = \square$

$6 \times 7 = 6 \times (5 + 2)$ Think: $7 = 5 + 2$

$6 \times 7 = (6 \times 5) + (6 \times 2)$ Multiply each addend by 6.

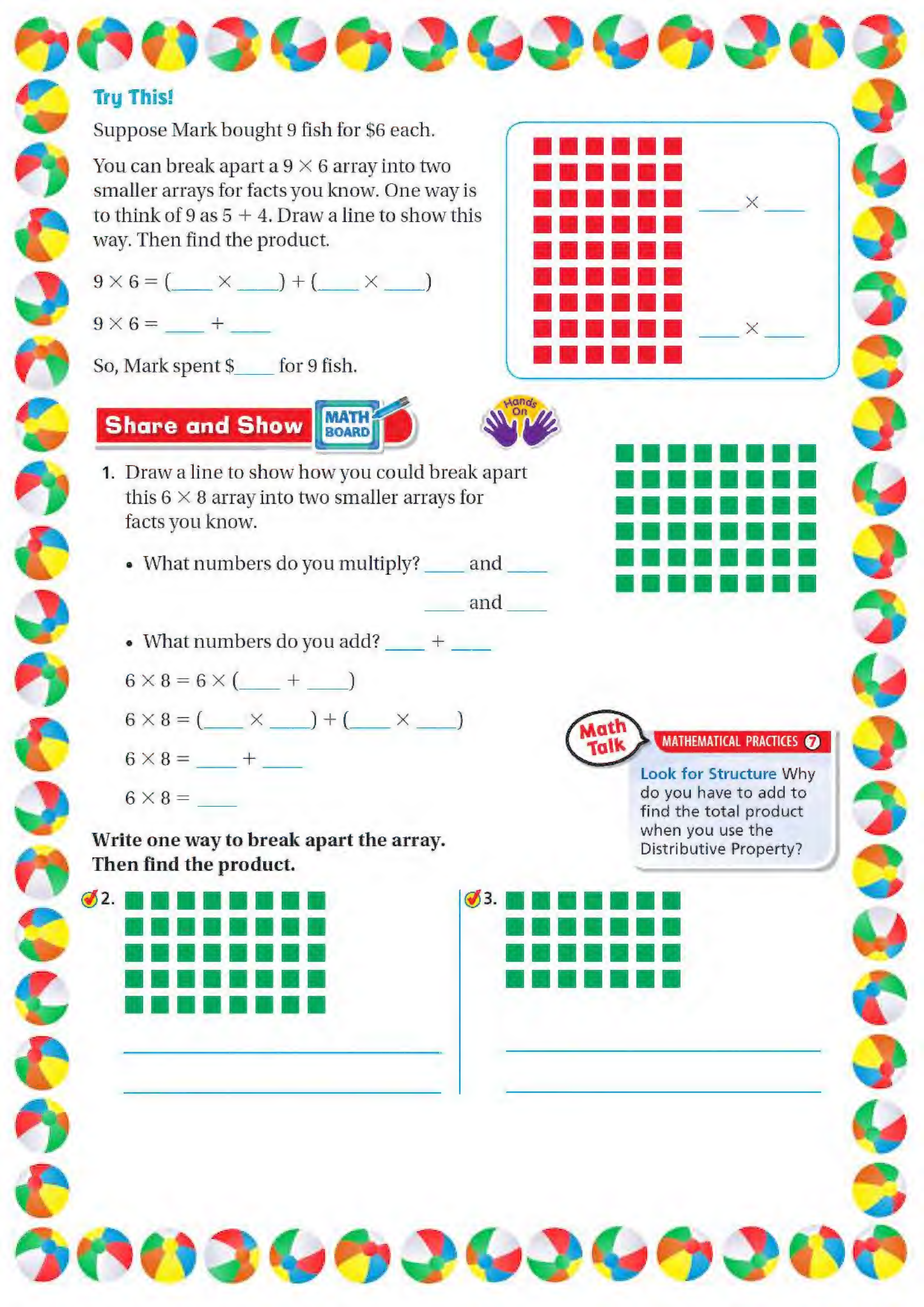
$6 \times 7 =$ _____ + _____ Add the products.

$6 \times 7 =$ _____

So, Mark spent $_____ for his new fish.

Math Talk MATHEMATICAL PRACTICES 2

Reason Quantitatively What other ways could you break apart the 6 × 7 array?



Try This!

Suppose Mark bought 9 fish for $6 each.

You can break apart a 9×6 array into two smaller arrays for facts you know. One way is to think of 9 as $5 + 4$. Draw a line to show this way. Then find the product.

$9 \times 6 = (____ \times ____) + (____ \times ____)$

$9 \times 6 = ____ + ____$

So, Mark spent $____ for 9 fish.

Share and Show

1. Draw a line to show how you could break apart this 6×8 array into two smaller arrays for facts you know.

- What numbers do you multiply? ____ and ____

  ____ and ____

- What numbers do you add? ____ + ____

$6 \times 8 = 6 \times (____ + ____)$

$6 \times 8 = (____ \times ____) + (____ \times ____)$

$6 \times 8 = ____ + ____$

$6 \times 8 = ____$

MATHEMATICAL PRACTICES 7

Look for Structure Why do you have to add to find the total product when you use the Distributive Property?

Write one way to break apart the array. Then find the product.

2.

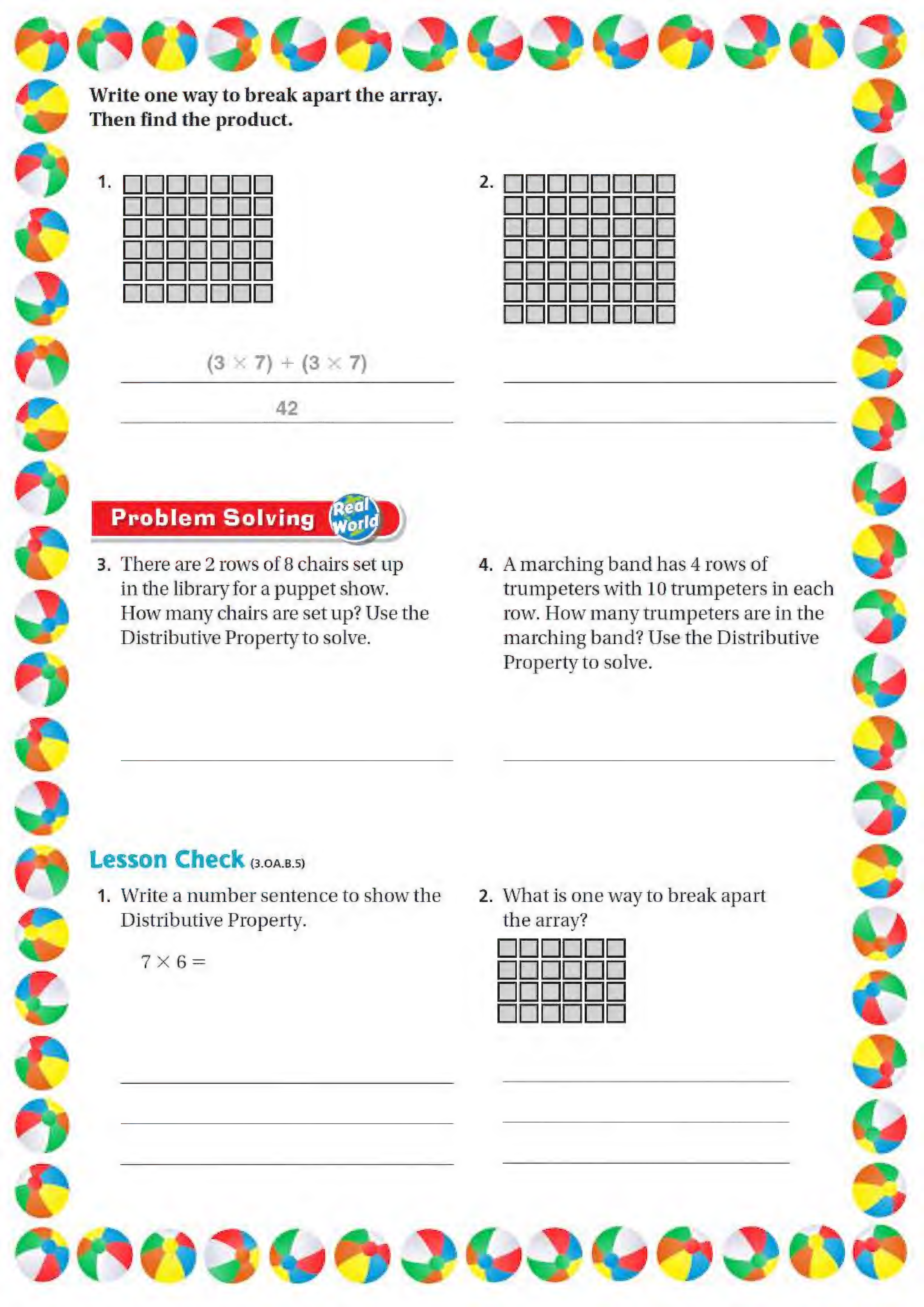
____

____

3.

____

____



Write one way to break apart the array.
Then find the product.

1\. (array)

$(3 \times 7) + (3 \times 7)$

42

2\. (array)

Problem Solving Real World

3\. There are 2 rows of 8 chairs set up in the library for a puppet show. How many chairs are set up? Use the Distributive Property to solve.

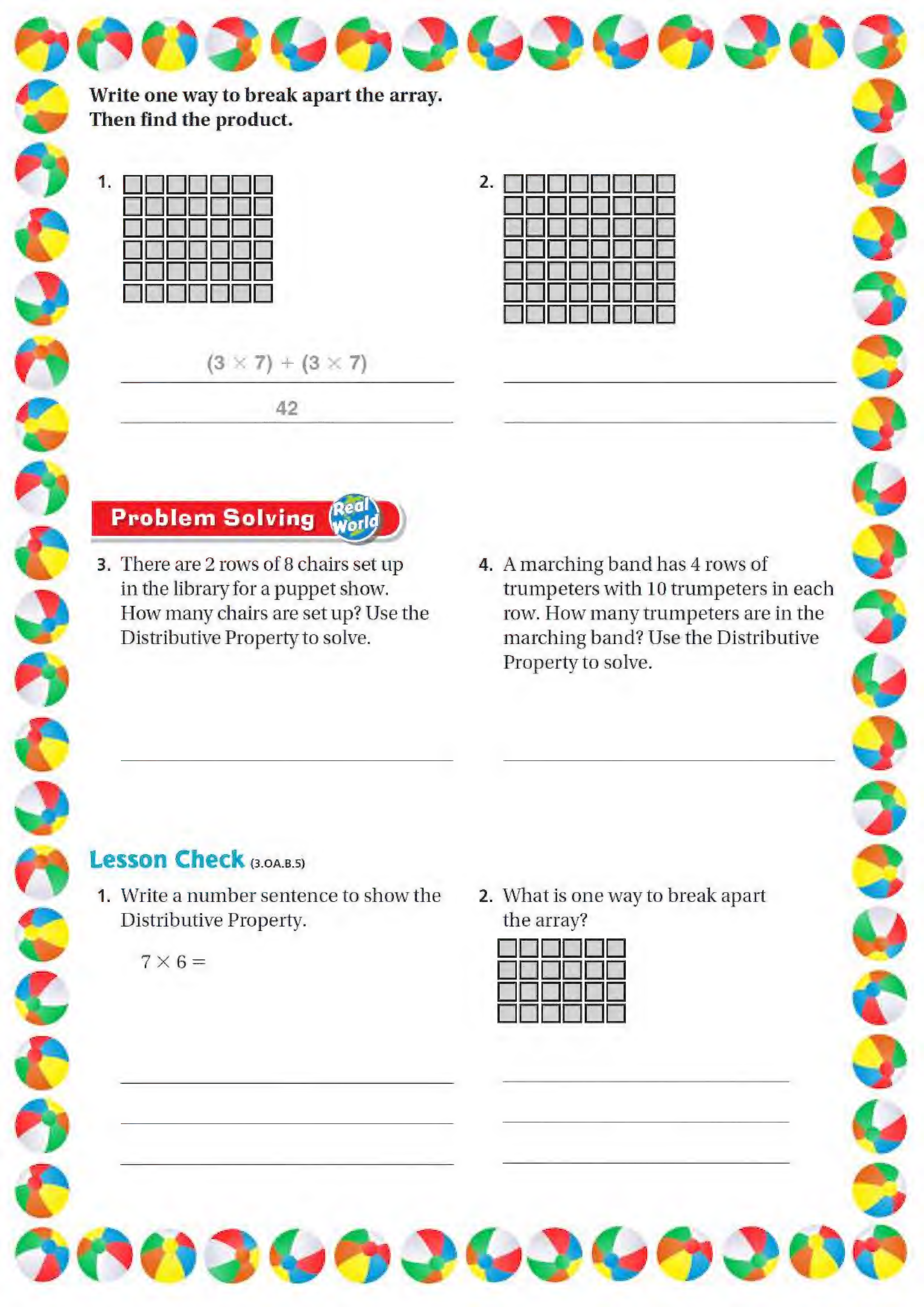
4\. A marching band has 4 rows of trumpeters with 10 trumpeters in each row. How many trumpeters are in the marching band? Use the Distributive Property to solve.

Lesson Check (3.OA.B.5)

1\. Write a number sentence to show the Distributive Property.

$7 \times 6 =$

2\. What is one way to break apart the array?



Write one way to break apart the array. Then find the product.

1. (3 × 7) + (3 × 7)

   42

2.

Problem Solving (Real World)

3. There are 2 rows of 8 chairs set up in the library for a puppet show. How many chairs are set up? Use the Distributive Property to solve.

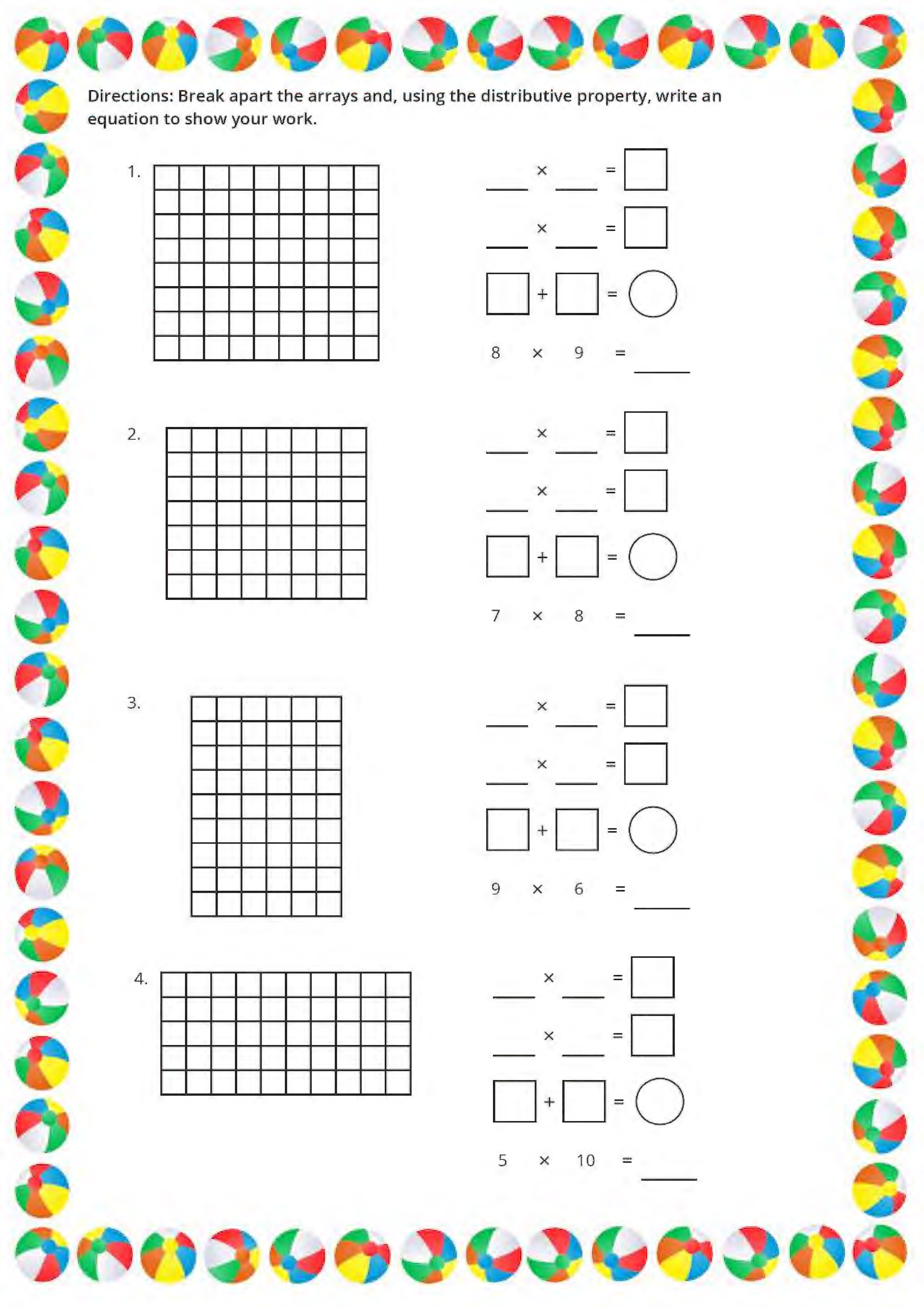
4. A marching band has 4 rows of trumpeters with 10 trumpeters in each row. How many trumpeters are in the marching band? Use the Distributive Property to solve.

Lesson Check (3.OA.B.5)

1. Write a number sentence to show the Distributive Property.

   $7 \times 6 =$

2. What is one way to break apart the array?



Directions: Break apart the arrays and, using the distributive property, write an equation to show your work.

1.

___ × ___ = ☐

___ × ___ = ☐

☐ + ☐ = ◯

8 × 9 = ____

2.

___ × ___ = ☐

___ × ___ = ☐

☐ + ☐ = ◯

7 × 8 = ____

3.

___ × ___ = ☐

___ × ___ = ☐

☐ + ☐ = ◯

9 × 6 = ____

4.

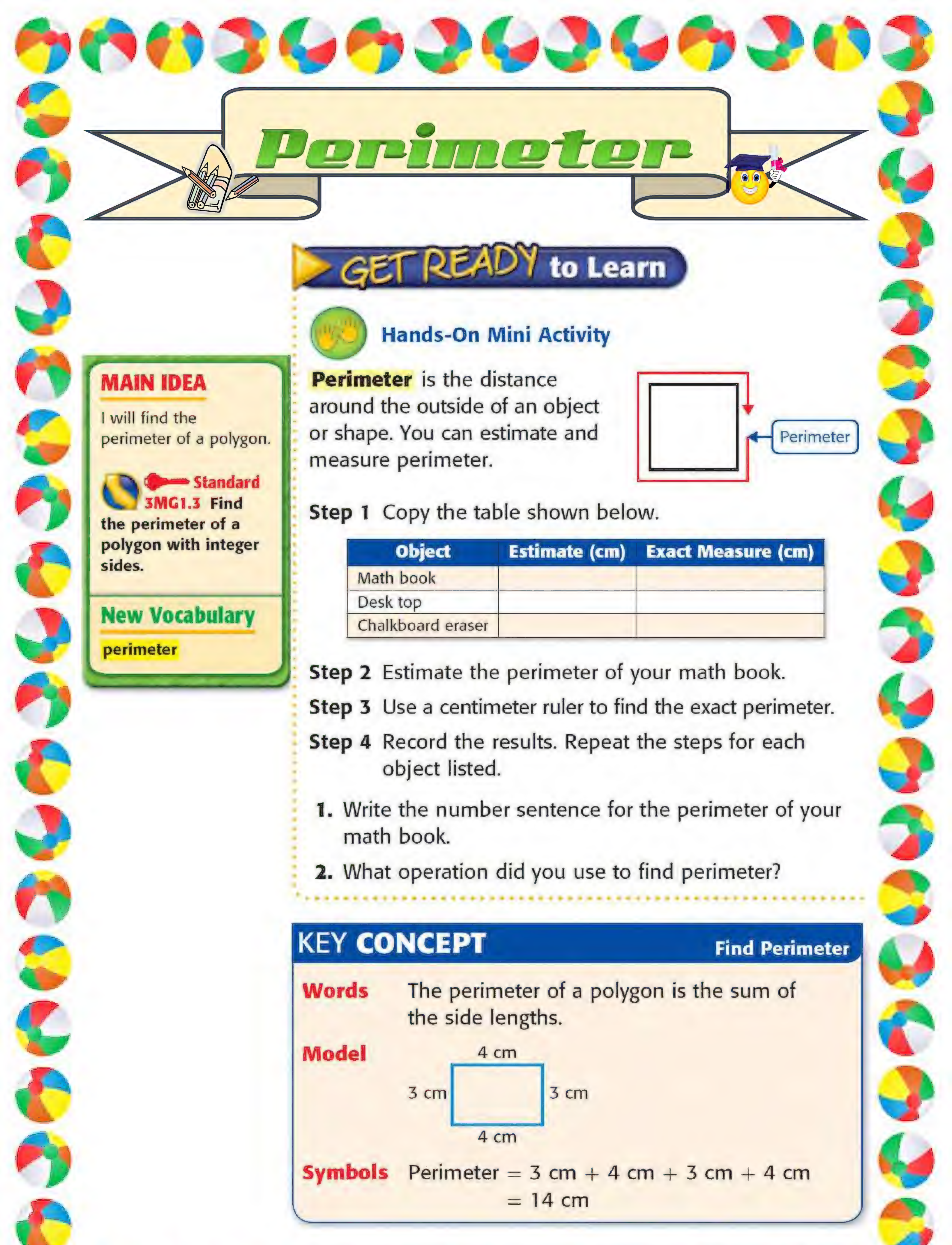
___ × ___ = ☐

___ × ___ = ☐

☐ + ☐ = ◯

5 × 10 = ____


Chapter
Five



Perimeter

GET READY to Learn

Hands-On Mini Activity

Perimeter is the distance around the outside of an object or shape. You can estimate and measure perimeter.

MAIN IDEA

I will find the perimeter of a polygon.

Standard 3MG1.3 Find the perimeter of a polygon with integer sides.

New Vocabulary

perimeter

Step 1 Copy the table shown below.

Object	Estimate (cm)	Exact Measure (cm)
Math book		
Desk top		
Chalkboard eraser		

Step 2 Estimate the perimeter of your math book.

Step 3 Use a centimeter ruler to find the exact perimeter.

Step 4 Record the results. Repeat the steps for each object listed.

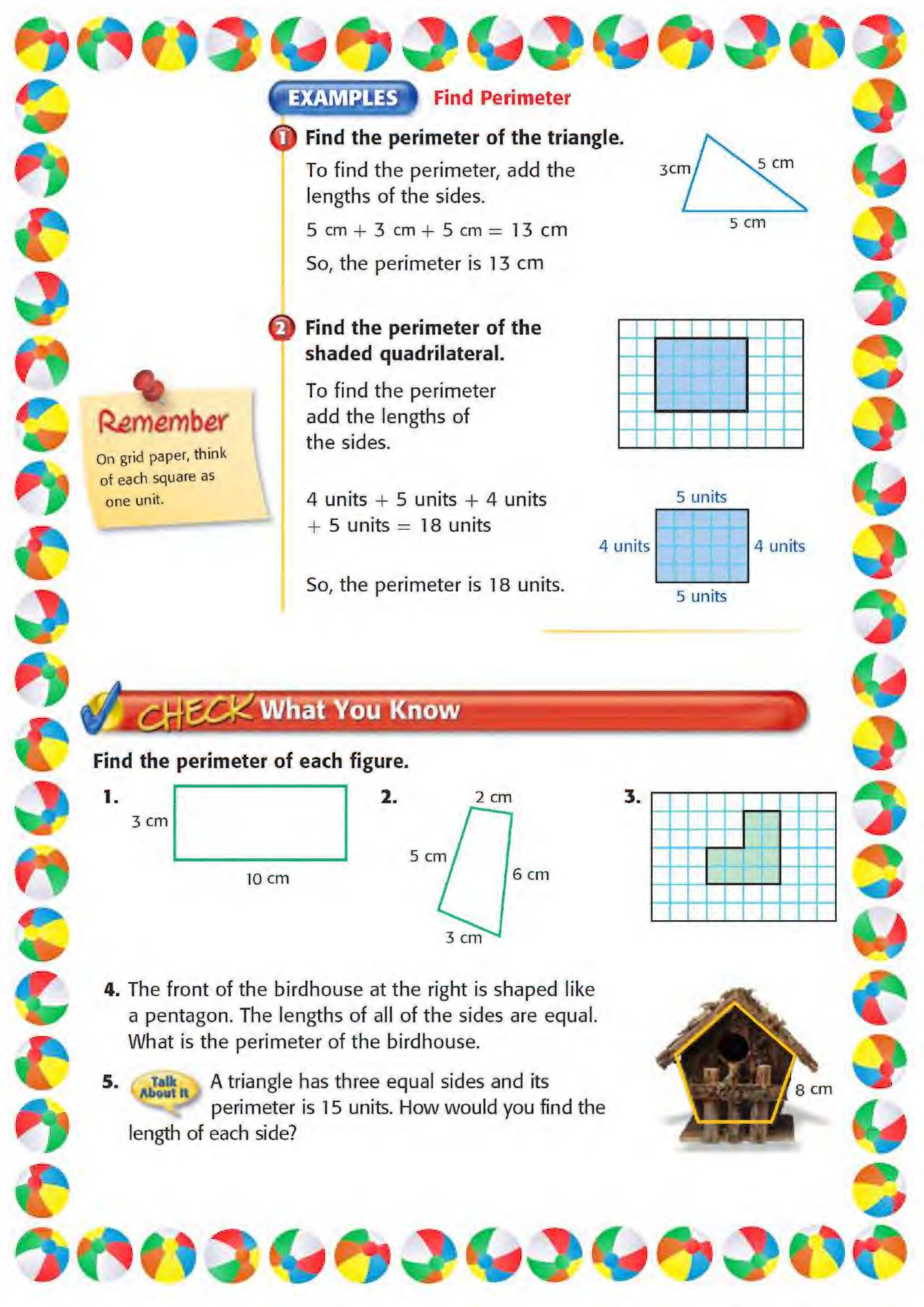
1. Write the number sentence for the perimeter of your math book.
2. What operation did you use to find perimeter?

KEY CONCEPT — Find Perimeter

Words The perimeter of a polygon is the sum of the side lengths.

Model

Symbols Perimeter = 3 cm + 4 cm + 3 cm + 4 cm
= 14 cm



EXAMPLES Find Perimeter

1 Find the perimeter of the triangle.

To find the perimeter, add the lengths of the sides.

5 cm + 3 cm + 5 cm = 13 cm

So, the perimeter is 13 cm

2 Find the perimeter of the shaded quadrilateral.

To find the perimeter add the lengths of the sides.

4 units + 5 units + 4 units + 5 units = 18 units

So, the perimeter is 18 units.

Remember

On grid paper, think of each square as one unit.

CHECK What You Know

Find the perimeter of each figure.

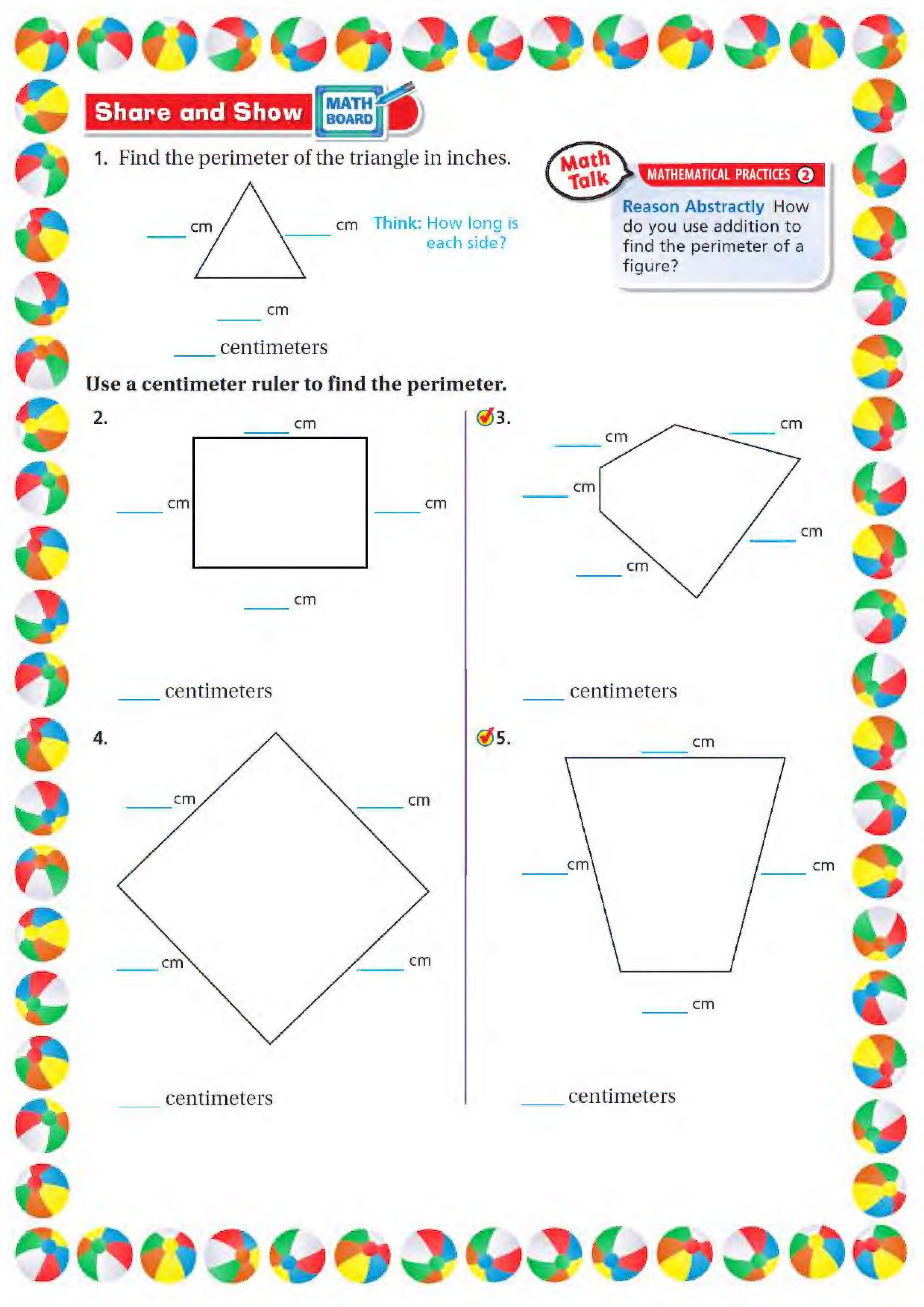
1.

2.

3.

4. The front of the birdhouse at the right is shaped like a pentagon. The lengths of all of the sides are equal. What is the perimeter of the birdhouse.

5. Talk About It A triangle has three equal sides and its perimeter is 15 units. How would you find the length of each side?



Share and Show MATH BOARD

1. Find the perimeter of the triangle in inches.

____ cm ____ cm ____ cm

Think: How long is each side?

____ centimeters

Math Talk **MATHEMATICAL PRACTICES 2**

Reason Abstractly How do you use addition to find the perimeter of a figure?

Use a centimeter ruler to find the perimeter.

2. ____ cm ____ cm ____ cm ____ cm

____ centimeters

3. ____ cm ____ cm ____ cm ____ cm ____ cm

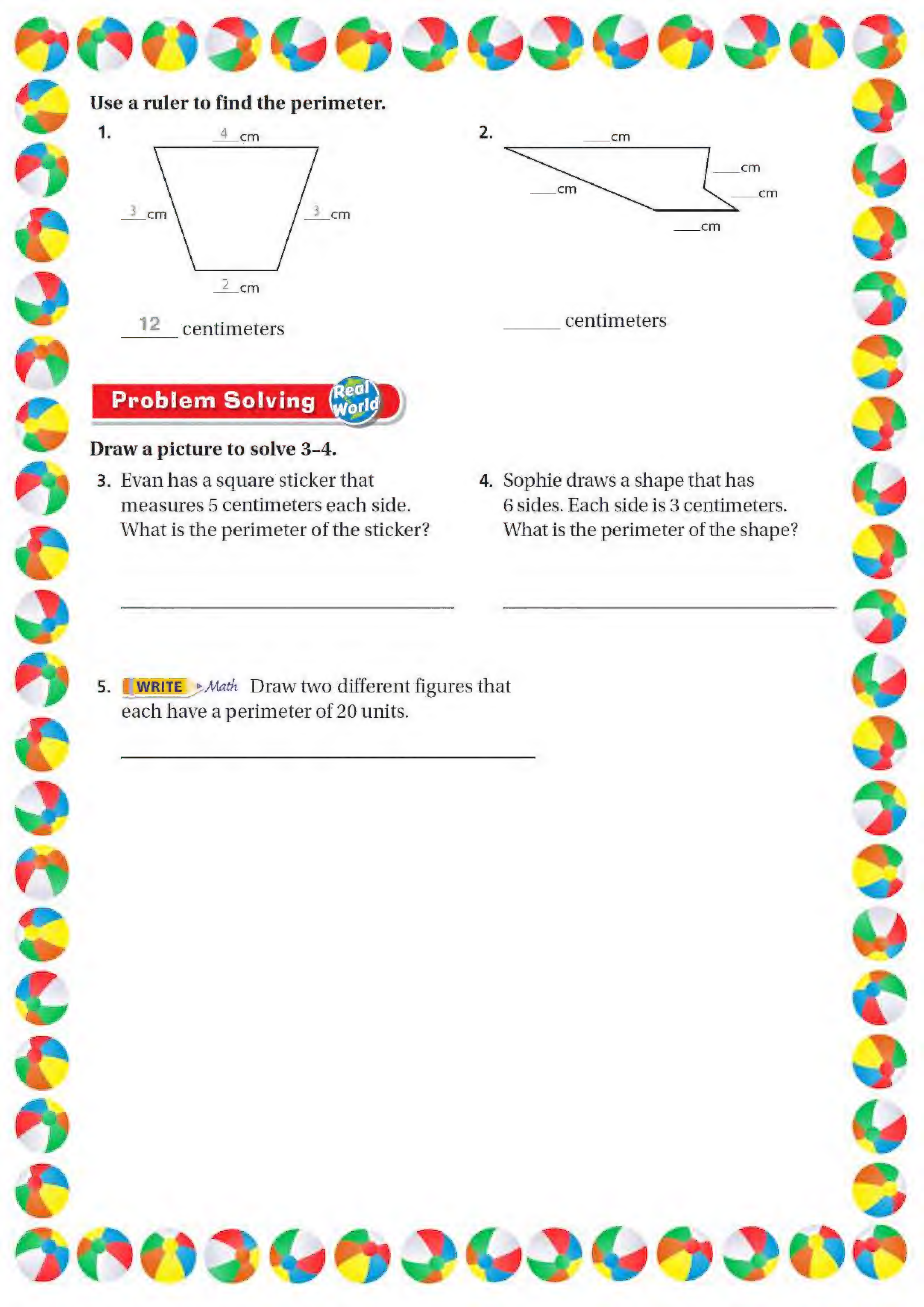
____ centimeters

4. ____ cm ____ cm ____ cm ____ cm

____ centimeters

5. ____ cm ____ cm ____ cm ____ cm

____ centimeters



Use a ruler to find the perimeter.

1.

12 centimeters

2.

_____ centimeters

Problem Solving Real World

Draw a picture to solve 3–4.

3. Evan has a square sticker that measures 5 centimeters each side. What is the perimeter of the sticker?

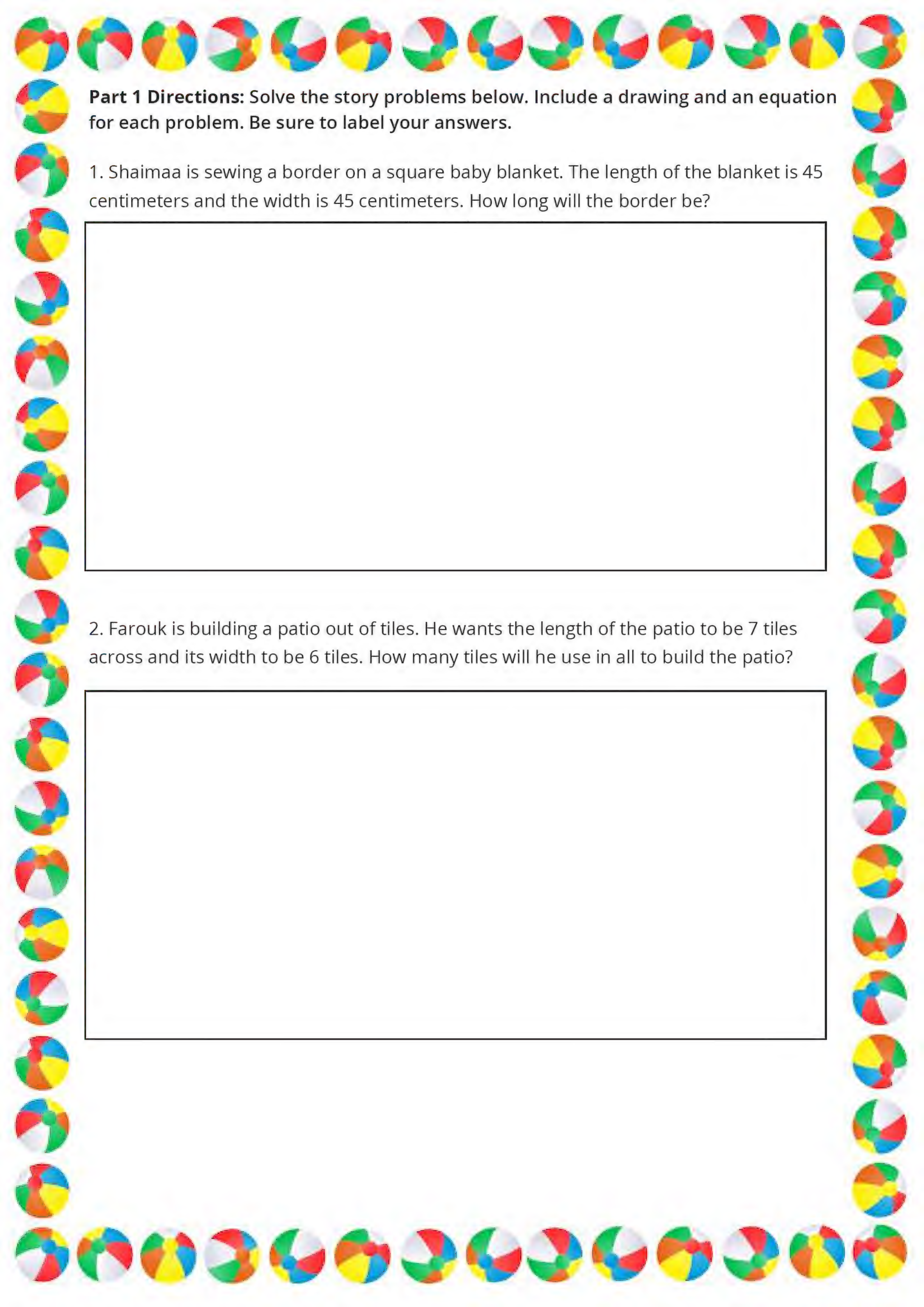
____

4. Sophie draws a shape that has 6 sides. Each side is 3 centimeters. What is the perimeter of the shape?

____

5. WRITE Math Draw two different figures that each have a perimeter of 20 units.

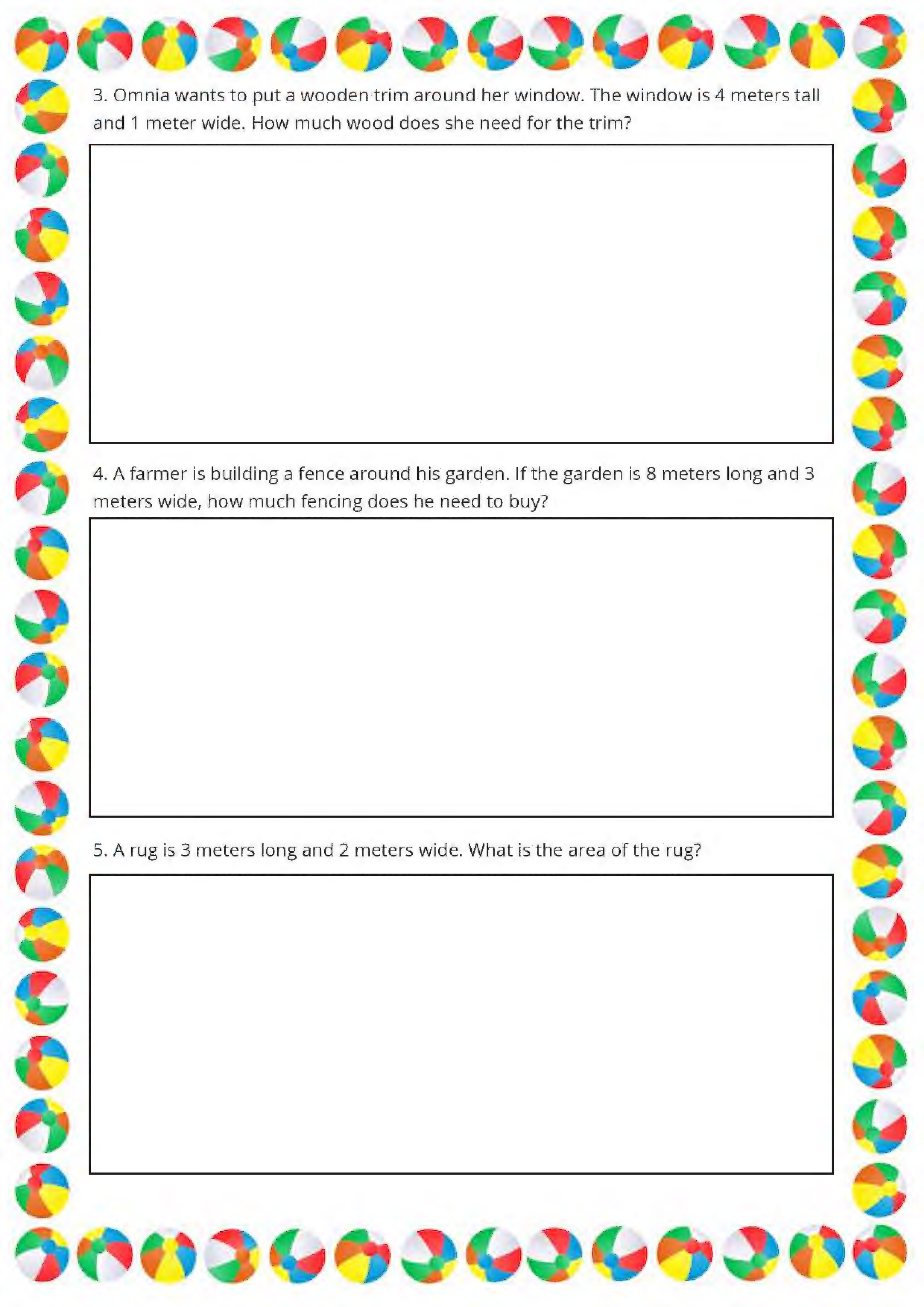
____



Part 1 Directions: Solve the story problems below. Include a drawing and an equation for each problem. Be sure to label your answers.

1. Shaimaa is sewing a border on a square baby blanket. The length of the blanket is 45 centimeters and the width is 45 centimeters. How long will the border be?

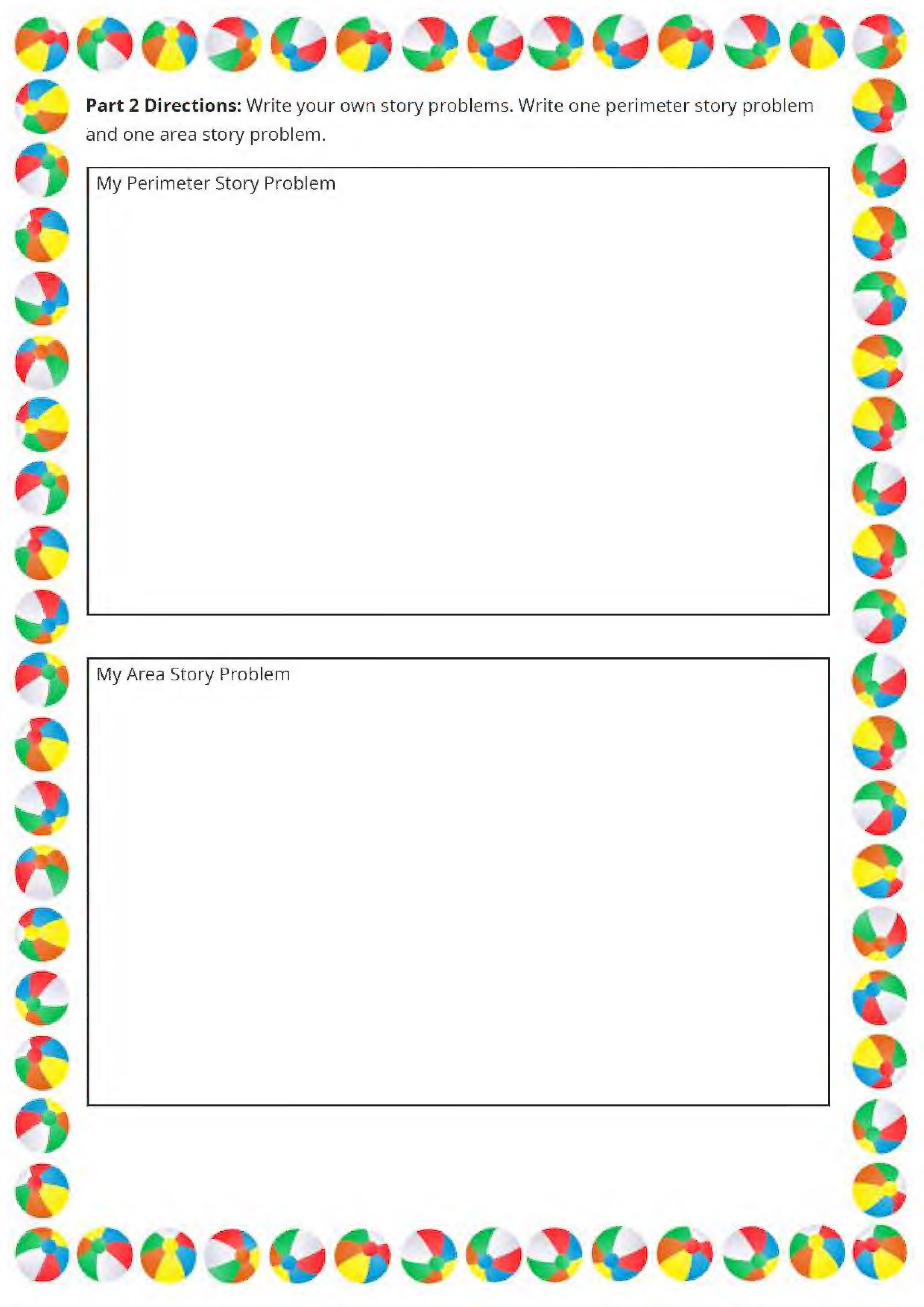
2. Farouk is building a patio out of tiles. He wants the length of the patio to be 7 tiles across and its width to be 6 tiles. How many tiles will he use in all to build the patio?



3. Omnia wants to put a wooden trim around her window. The window is 4 meters tall and 1 meter wide. How much wood does she need for the trim?

4. A farmer is building a fence around his garden. If the garden is 8 meters long and 3 meters wide, how much fencing does he need to buy?

5. A rug is 3 meters long and 2 meters wide. What is the area of the rug?



Part 2 Directions: Write your own story problems. Write one perimeter story problem and one area story problem.

My Perimeter Story Problem

My Area Story Problem



Multiplication Strategies with Multiples of 10

Essential Question What strategies can you use to multiply with multiples of 10?

Unlock the Problem

Real World | Hands On

You can use models and place value to multiply with multiples of 10.

- What is a product of 10 and the counting numbers 1, 2, 3, and so on?

  ______

Activity Model multiples of 10.

Materials ■ base-ten blocks

Model the first nine multiples of 10.

1×10 1×1 ten 1 ten 10	2×10 2×1 ten 2 tens 20	3×10 3×1 ten 3 tens 30

What are the first nine multiples of 10?

10, 20, 30, ______, ______, ______, ______, ______, ______

Best Care Veterinary Clinic offered free pet care classes for 5 days. Erin attended the pet care class for 30 minutes each day. How many minutes did Erin attend the class?

One Way Use a number line.

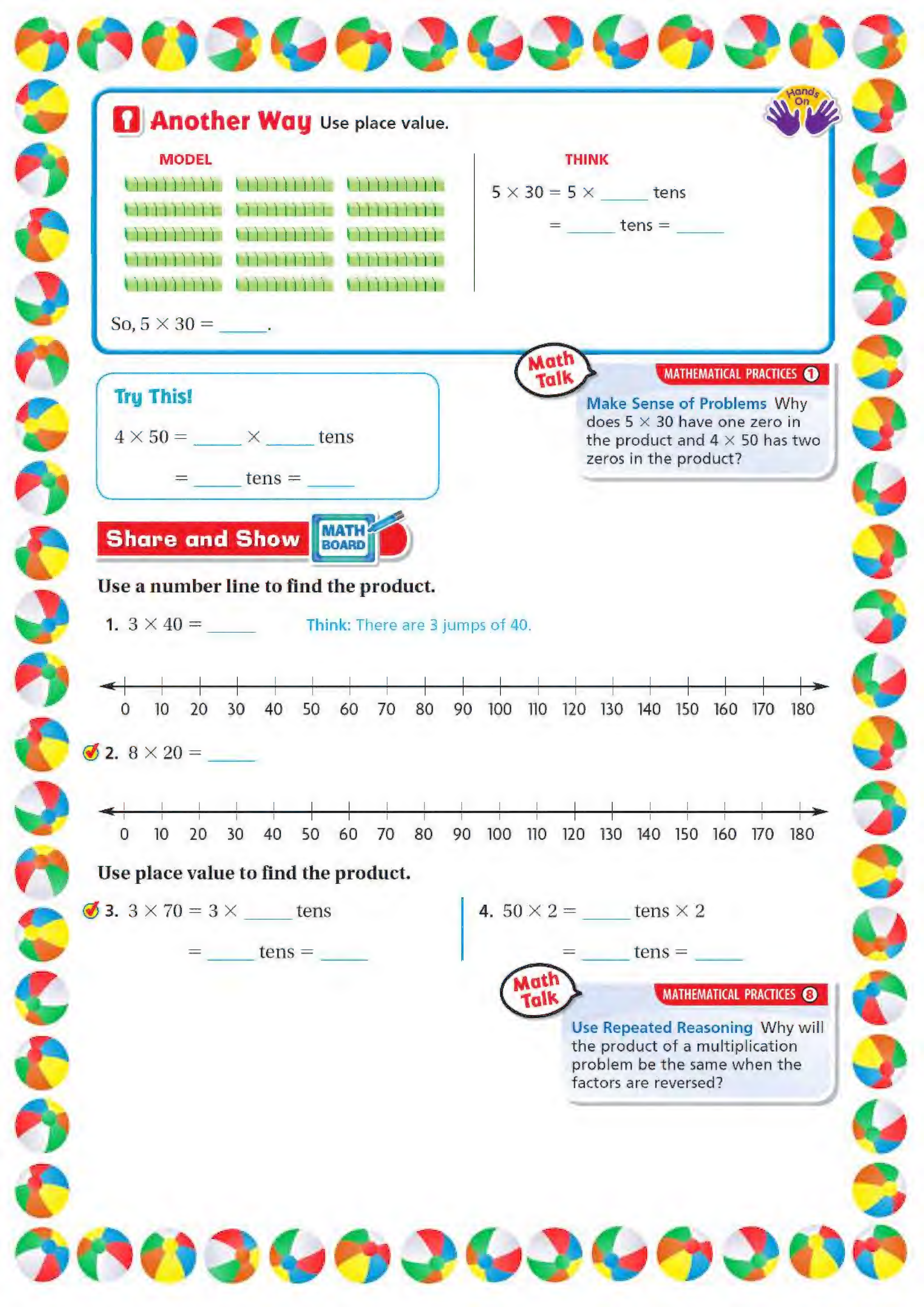
$5 \times 30 = ■$ Think: 30 = 3 tens

STEP 1 Complete the number line. Write the labels for the multiples of 10.

STEP 2 Draw jumps on the number line to show 5 groups of 3 tens.

$5 \times 30 =$ ______

So, Erin attended the pet care class for ______ minutes.



Another Way Use place value.

Hands On

MODEL

THINK

$5 \times 30 = 5 \times$ ____ tens

$=$ ____ tens $=$ ____

So, $5 \times 30 =$ ____.

Try This!

$4 \times 50 =$ ____ $\times$ ____ tens

$=$ ____ tens $=$ ____

Math Talk

MATHEMATICAL PRACTICES 1

Make Sense of Problems Why does 5×30 have one zero in the product and 4×50 has two zeros in the product?

Share and Show

MATH BOARD

Use a number line to find the product.

1. $3 \times 40 =$ ____ Think: There are 3 jumps of 40.

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180

2. $8 \times 20 =$ ____

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180

Use place value to find the product.

3. $3 \times 70 = 3 \times$ ____ tens

$=$ ____ tens $=$ ____

4. $50 \times 2 =$ ____ tens $\times 2$

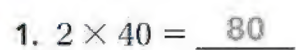
$=$ ____ tens $=$ ____

Math Talk

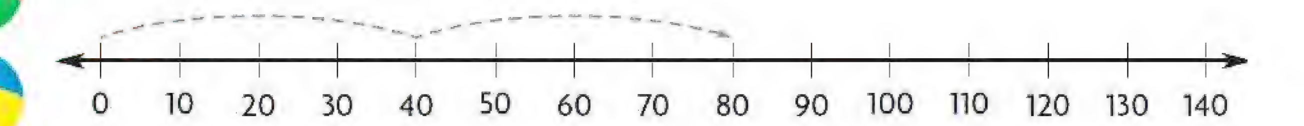
MATHEMATICAL PRACTICES 8

Use Repeated Reasoning Why will the product of a multiplication problem be the same when the factors are reversed?

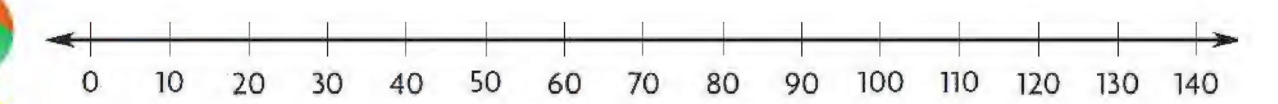
Use a number line to find the product.



1. $2 \times 40 =$ 80



2. $4 \times 30 =$ ______



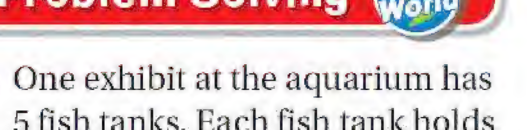
Use place value to find the product.

3. $5 \times 70 = 5 \times$ ______ tens

$=$ ______ tens $=$ ______

4. $60 \times 4 =$ ______ tens $\times 4$

$=$ ______ tens $=$ ______



5. One exhibit at the aquarium has 5 fish tanks. Each fish tank holds 50 gallons of water. How much water do the 5 tanks hold?

____

6. In another aquarium display, there are 40 fish in each of 7 large tanks. How many fish are in the display?

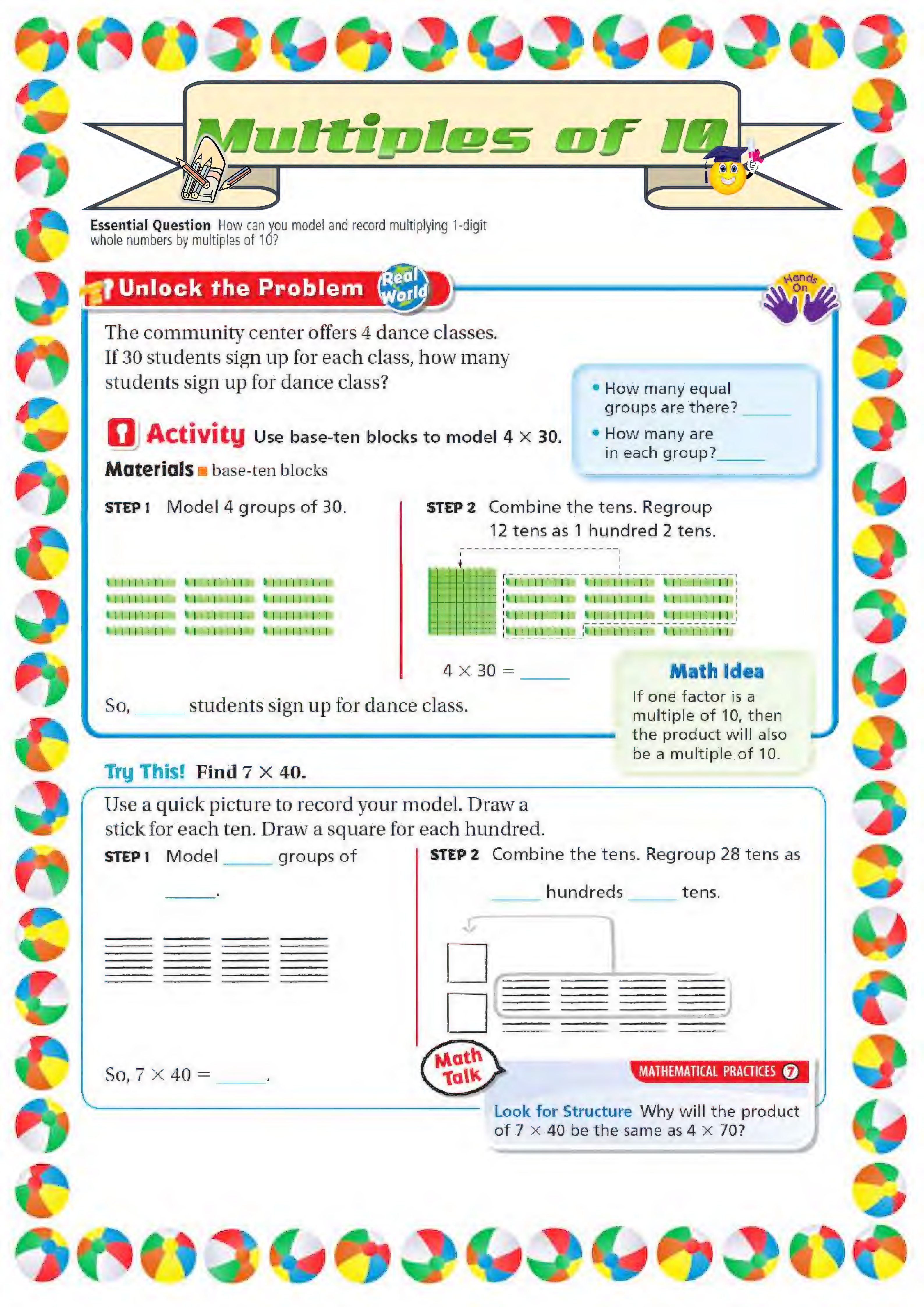
____

7. WRITE ▸ *Math* Which strategy do you prefer to use to multiply with multiples of 10: base ten blocks, a number line, or place value? Explain why.

____

____


Chapter
Six



Multiples of 10

Essential Question How can you model and record multiplying 1-digit whole numbers by multiples of 10?

Unlock the Problem

Real World | Hands On

The community center offers 4 dance classes. If 30 students sign up for each class, how many students sign up for dance class?

- How many equal groups are there? _____
- How many are in each group? _____

Activity Use base-ten blocks to model 4 × 30.

Materials ■ base-ten blocks

STEP 1 Model 4 groups of 30.

STEP 2 Combine the tens. Regroup 12 tens as 1 hundred 2 tens.

4 × 30 = _____

So, _____ students sign up for dance class.

Math Idea

If one factor is a multiple of 10, then the product will also be a multiple of 10.

Try This! Find 7 × 40.

Use a quick picture to record your model. Draw a stick for each ten. Draw a square for each hundred.

STEP 1 Model _____ groups of _____.

STEP 2 Combine the tens. Regroup 28 tens as _____ hundreds _____ tens.

So, 7 × 40 = _____.

Math Talk MATHEMATICAL PRACTICES 7

Look for Structure Why will the product of 7 × 40 be the same as 4 × 70?



On Your Own

Find the product.

1. $4 \times 50 =$ 200

2. $60 \times 3 =$ ______

3. ______ $= 60 \times 5$

Find the product.

4. $\begin{array}{r} 80 \\ \times\ 3 \\ \hline \end{array}$

5. $\begin{array}{r} 50 \\ \times\ 2 \\ \hline \end{array}$

6. $\begin{array}{r} 60 \\ \times\ 7 \\ \hline \end{array}$

7. $\begin{array}{r} 70 \\ \times\ 4 \\ \hline \end{array}$

8. $6 \times 90 =$ ____

9. $9 \times 70 =$ ____

10. $8 \times 90 =$ ____

Find the product. Use base-ten blocks or draw a quick picture on your MathBoard.

11. $8 \times 50 =$ ____

12. ____ $= 3 \times 90$

13. $2 \times 80 =$ ____

Find the product.

14. $\begin{array}{r} 80 \\ \times\ 3 \\ \hline \end{array}$

15. $\begin{array}{r} 60 \\ \times\ 9 \\ \hline \end{array}$

16. $\begin{array}{r} 90 \\ \times\ 8 \\ \hline \end{array}$

17. $\begin{array}{r} 80 \\ \times\ 8 \\ \hline \end{array}$

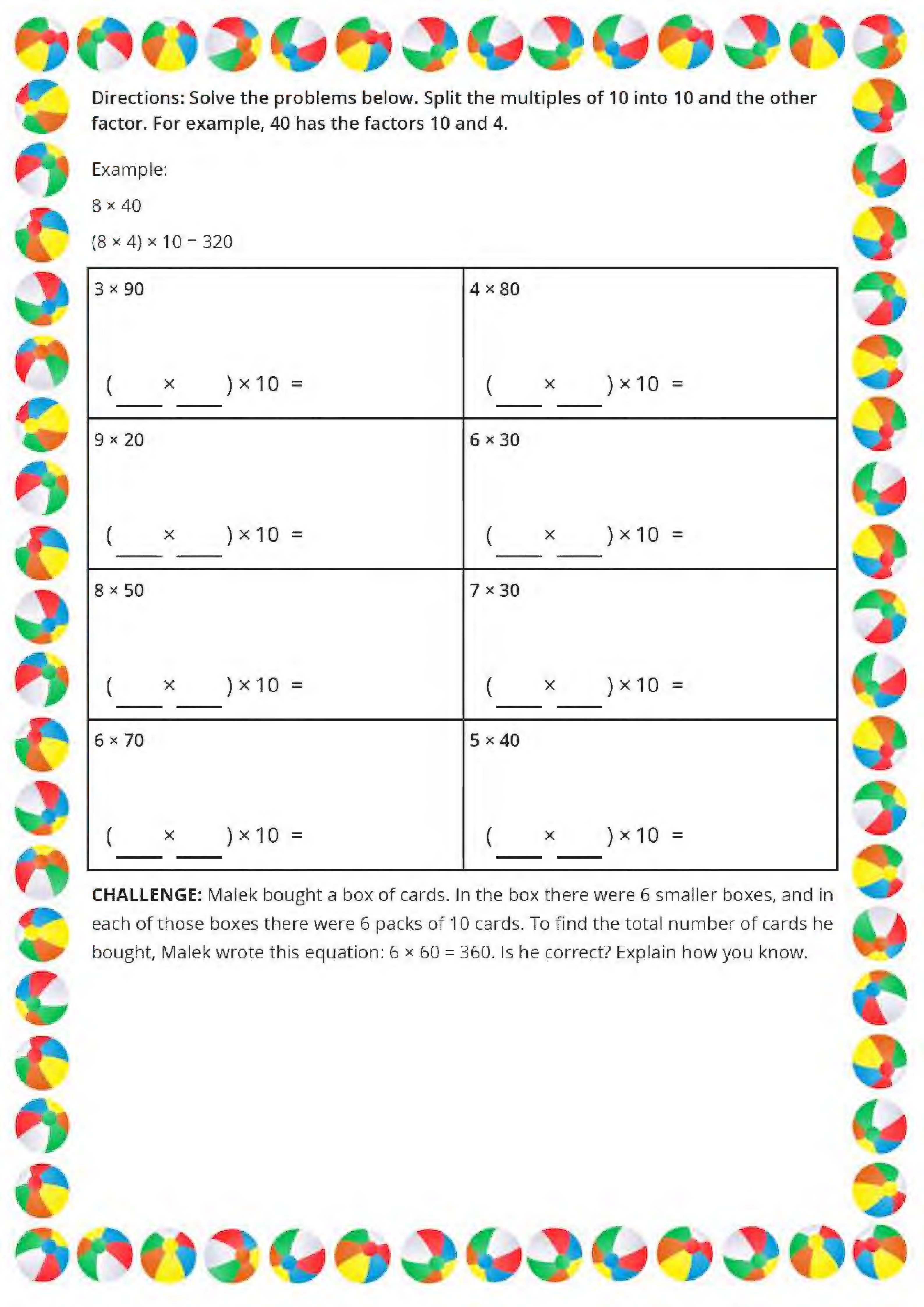
Practice: Copy and Solve Find the product.

18. 6×70

19. 9×90

20. 70×8

21. 90×7



Directions: Solve the problems below. Split the multiples of 10 into 10 and the other factor. For example, 40 has the factors 10 and 4.

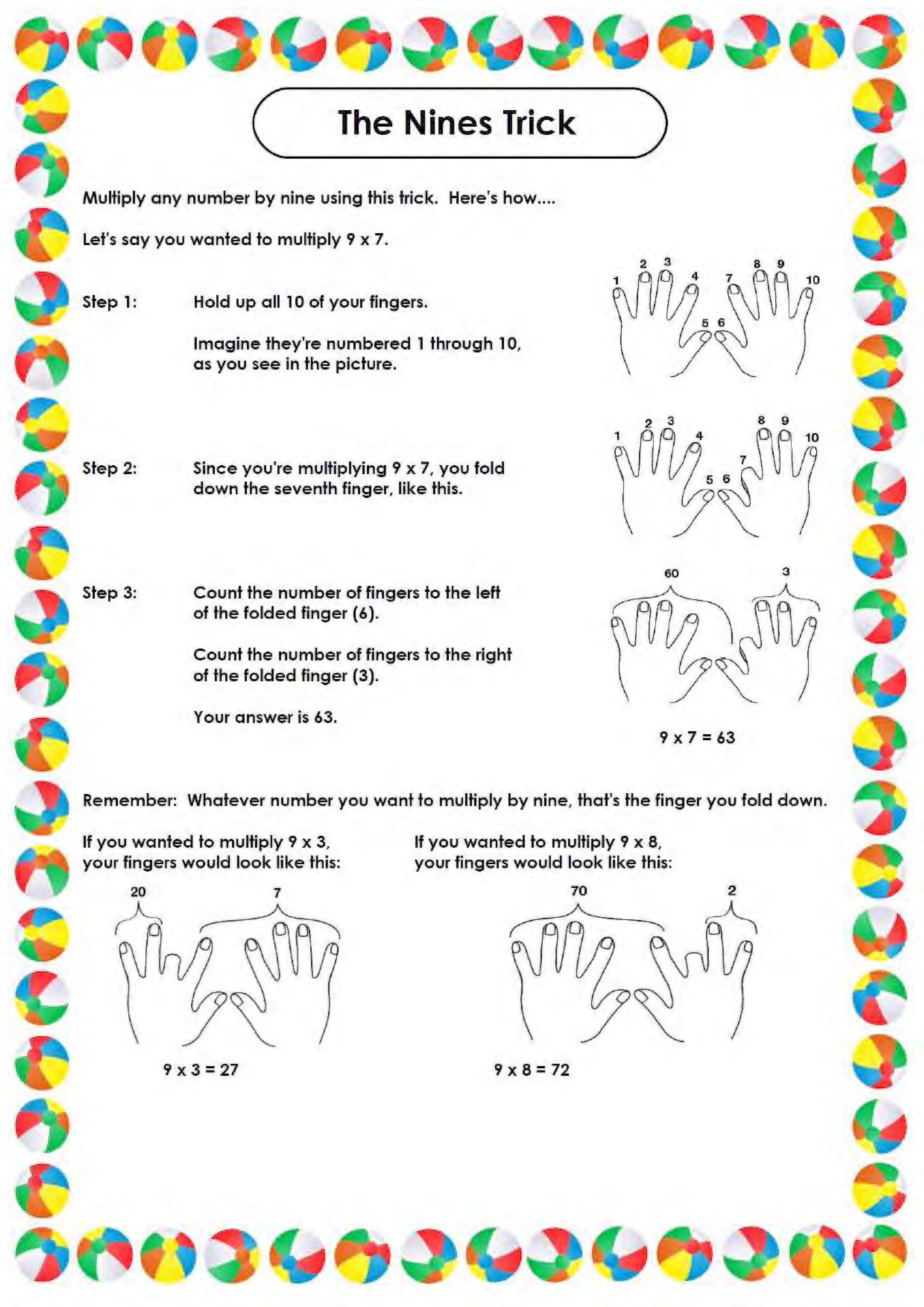
Example:

8 × 40

(8 × 4) × 10 = 320

3 × 90 (___ × ___) × 10 =	4 × 80 (___ × ___) × 10 =
9 × 20 (___ × ___) × 10 =	6 × 30 (___ × ___) × 10 =
8 × 50 (___ × ___) × 10 =	7 × 30 (___ × ___) × 10 =
6 × 70 (___ × ___) × 10 =	5 × 40 (___ × ___) × 10 =

CHALLENGE: Malek bought a box of cards. In the box there were 6 smaller boxes, and in each of those boxes there were 6 packs of 10 cards. To find the total number of cards he bought, Malek wrote this equation: 6 × 60 = 360. Is he correct? Explain how you know.



The Nines Trick

Multiply any number by nine using this trick. Here's how....

Let's say you wanted to multiply 9 x 7.

Step 1: Hold up all 10 of your fingers.

Imagine they're numbered 1 through 10, as you see in the picture.

Step 2: Since you're multiplying 9 x 7, you fold down the seventh finger, like this.

Step 3: Count the number of fingers to the left of the folded finger (6).

Count the number of fingers to the right of the folded finger (3).

Your answer is 63.

9 x 7 = 63

Remember: Whatever number you want to multiply by nine, that's the finger you fold down.

If you wanted to multiply 9 x 3, your fingers would look like this:

9 x 3 = 27

If you wanted to multiply 9 x 8, your fingers would look like this:

9 x 8 = 72

The Nines Trick

Tell which multiplication fact is shown by the fingers in these pictures. Write the multiplication fact and the answer.

30 6

60 3

_________ x _________ = _________   _________ x _________ = _________

Use the nines trick to solve these multiplication facts.

9 x 8 = _________   9 x 3 = _________

5 x 9 = _________   6 x 9 = _________

9 x 9 = _________   9 x 2 = _________

4 x 9 = _________   9 x 7 = _________

Can you use the nines trick to solve 6 x 7? Explain.

____

____

Can you use the nines trick to solve 12 x 9? Explain.

____

____

Another Nines Trick

Step 1: Make a column of numbers on your paper from 0 through 9.

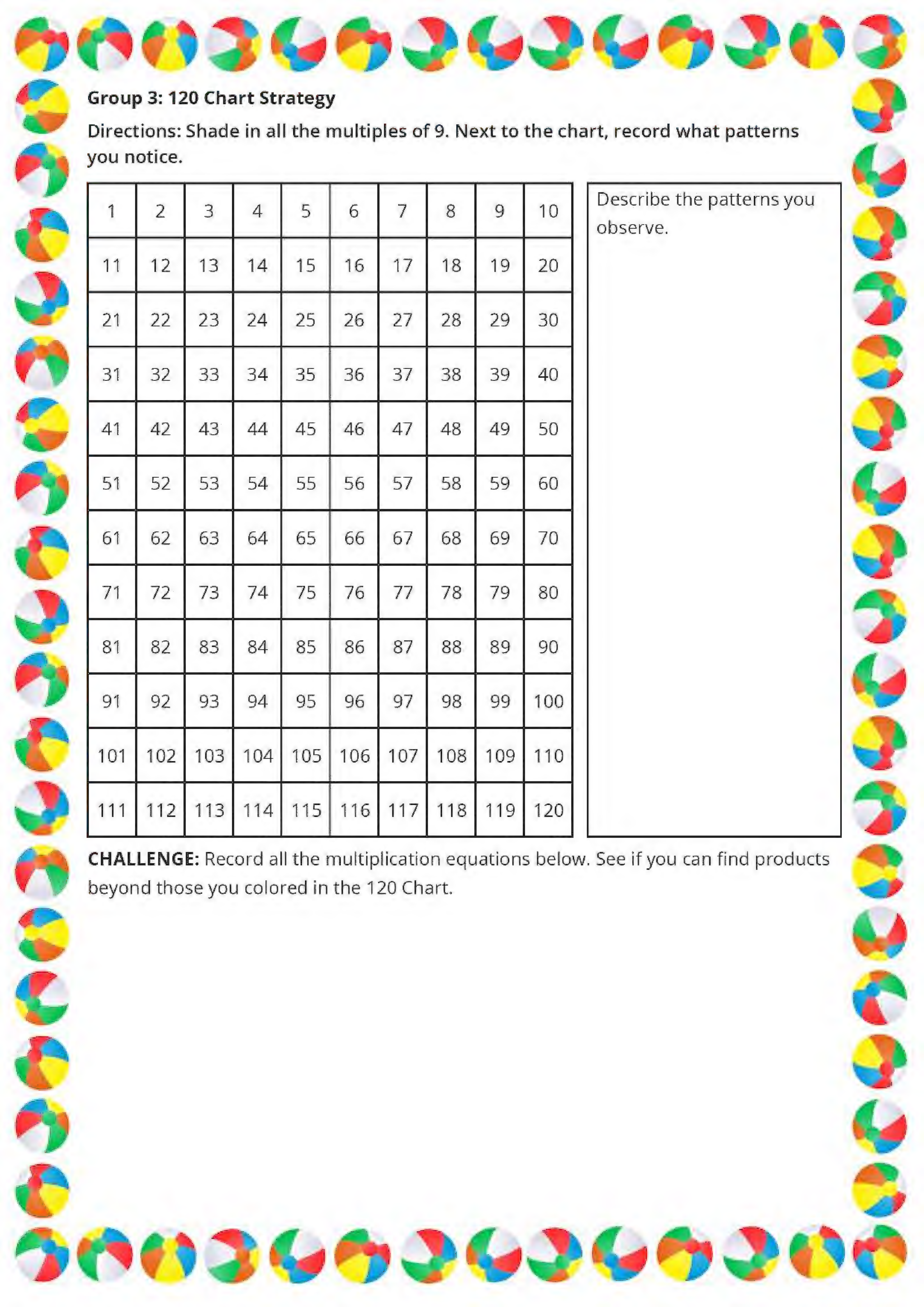
0
1
2
3
4
5
6
7
8
9

Step 2: Next to your column, you're going to make another column of numbers. This time, count backwards from 9 all the way down to 0.

0 **9**
1 **8**
2 **7**
3 **6**
4 **5**
5 **4**
6 **3**
7 **2**
8 **1**
9 **0**

Step 3: You've just written all the answers to your nines times tables. Write the facts next to the numbers.

0 9 = 9 x 1
1 8 = 9 x 2
2 7 = 9 x 3
3 6 = 9 x 4
4 5 = 9 x 5
5 4 = 9 x 6
6 3 = 9 x 7
7 2 = 9 x 8
8 1 = 9 x 9
9 0 = 9 x 10



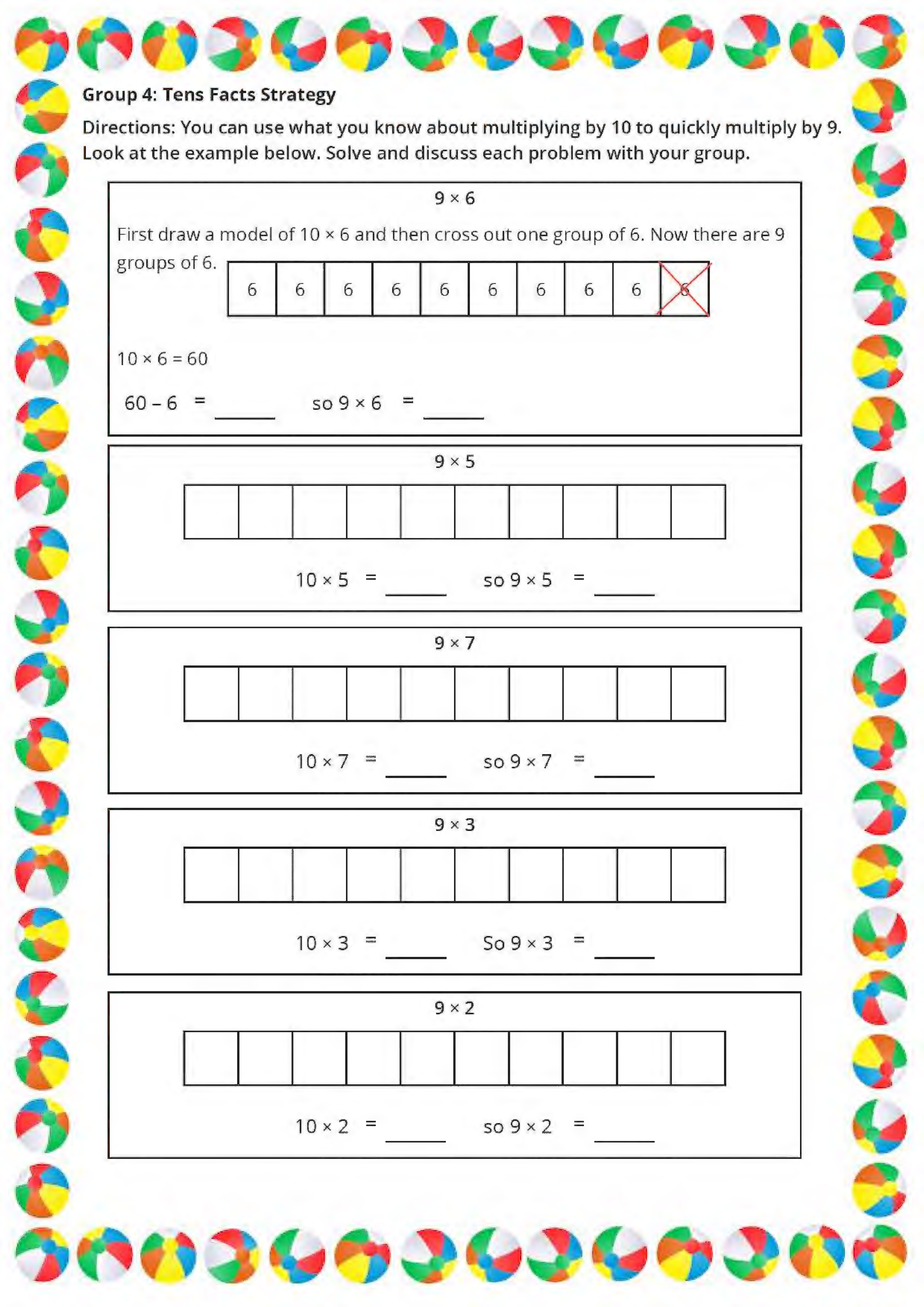
Group 3: 120 Chart Strategy

Directions: Shade in all the multiples of 9. Next to the chart, record what patterns you notice.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120

Describe the patterns you observe.

CHALLENGE: Record all the multiplication equations below. See if you can find products beyond those you colored in the 120 Chart.



Group 4: Tens Facts Strategy

Directions: You can use what you know about multiplying by 10 to quickly multiply by 9. Look at the example below. Solve and discuss each problem with your group.

9 × 6

First draw a model of 10 × 6 and then cross out one group of 6. Now there are 9 groups of 6.

6	6	6	6	6	6	6	6	6	~~6~~

10 × 6 = 60

60 – 6 = ______ so 9 × 6 = ______

9 × 5

10 × 5 = ______ so 9 × 5 = ______

9 × 7

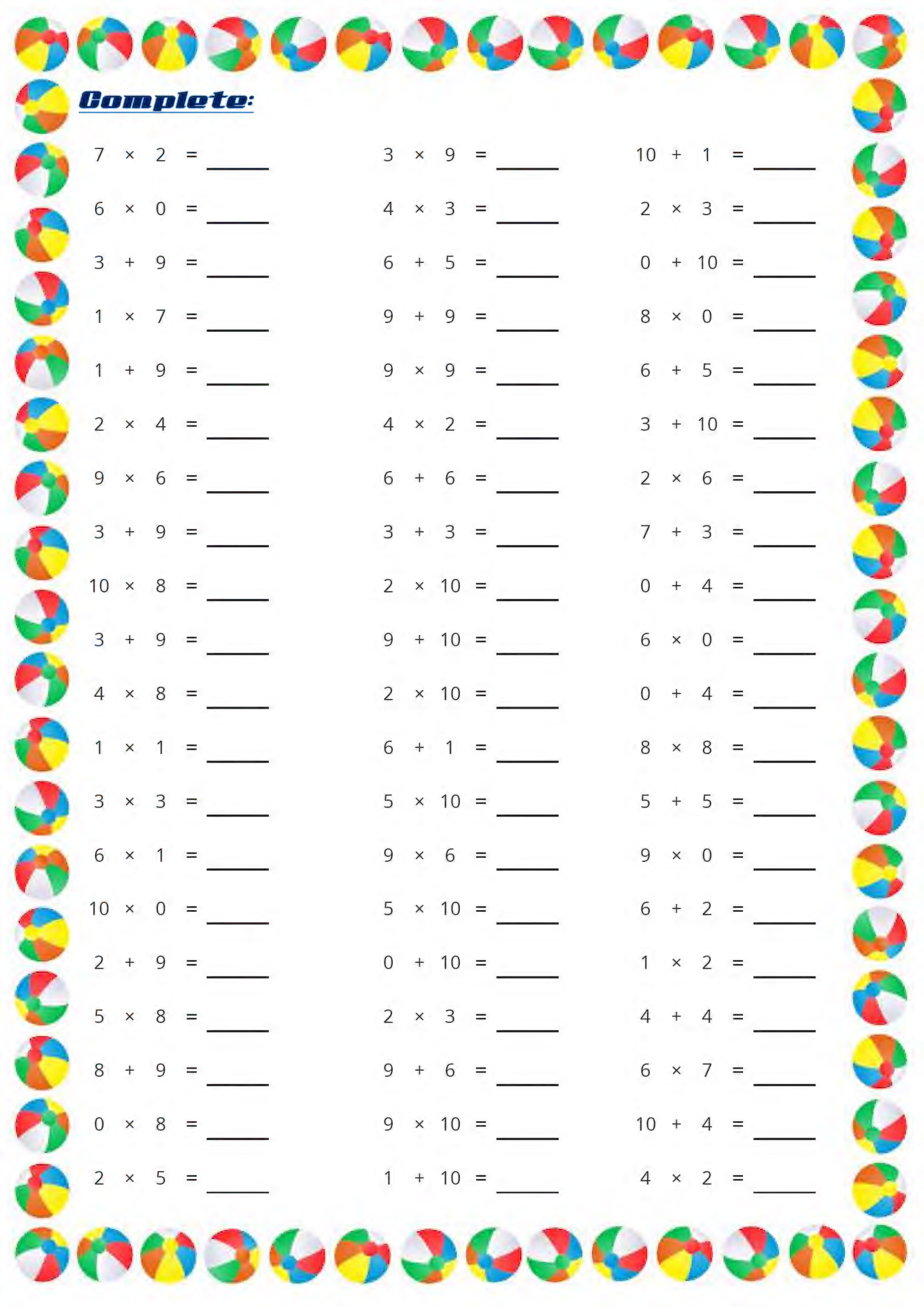
10 × 7 = ______ so 9 × 7 = ______

9 × 3

10 × 3 = ______ So 9 × 3 = ______

9 × 2

10 × 2 = ______ so 9 × 2 = ______



Complete:

7 × 2 = ______

6 × 0 = ______

3 + 9 = ______

1 × 7 = ______

1 + 9 = ______

2 × 4 = ______

9 × 6 = ______

3 + 9 = ______

10 × 8 = ______

3 + 9 = ______

4 × 8 = ______

1 × 1 = ______

3 × 3 = ______

6 × 1 = ______

10 × 0 = ______

2 + 9 = ______

5 × 8 = ______

8 + 9 = ______

0 × 8 = ______

2 × 5 = ______

3 × 9 = ______

4 × 3 = ______

6 + 5 = ______

9 + 9 = ______

9 × 9 = ______

4 × 2 = ______

6 + 6 = ______

3 + 3 = ______

2 × 10 = ______

9 + 10 = ______

2 × 10 = ______

6 + 1 = ______

5 × 10 = ______

9 × 6 = ______

5 × 10 = ______

0 + 10 = ______

2 × 3 = ______

9 + 6 = ______

9 × 10 = ______

1 + 10 = ______

10 + 1 = ______

2 × 3 = ______

0 + 10 = ______

8 × 0 = ______

6 + 5 = ______

3 + 10 = ______

2 × 6 = ______

7 + 3 = ______

0 + 4 = ______

6 × 0 = ______

0 + 4 = ______

8 × 8 = ______

5 + 5 = ______

9 × 0 = ______

6 + 2 = ______

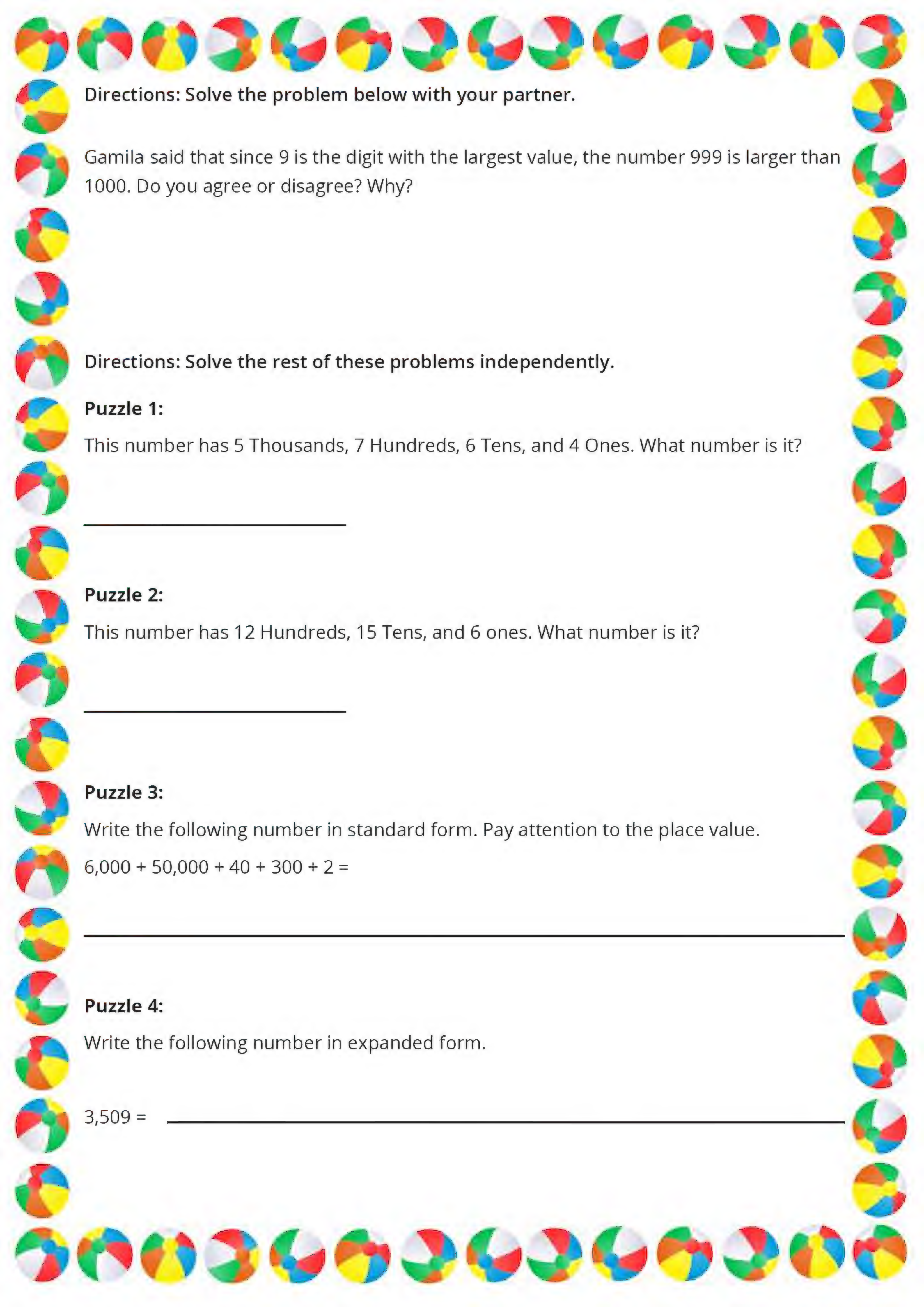
1 × 2 = ______

4 + 4 = ______

6 × 7 = ______

10 + 4 = ______

4 × 2 = ______



Directions: Solve the problem below with your partner.

Gamila said that since 9 is the digit with the largest value, the number 999 is larger than 1000. Do you agree or disagree? Why?

Directions: Solve the rest of these problems independently.

Puzzle 1:

This number has 5 Thousands, 7 Hundreds, 6 Tens, and 4 Ones. What number is it?

____

Puzzle 2:

This number has 12 Hundreds, 15 Tens, and 6 ones. What number is it?

____

Puzzle 3:

Write the following number in standard form. Pay attention to the place value.

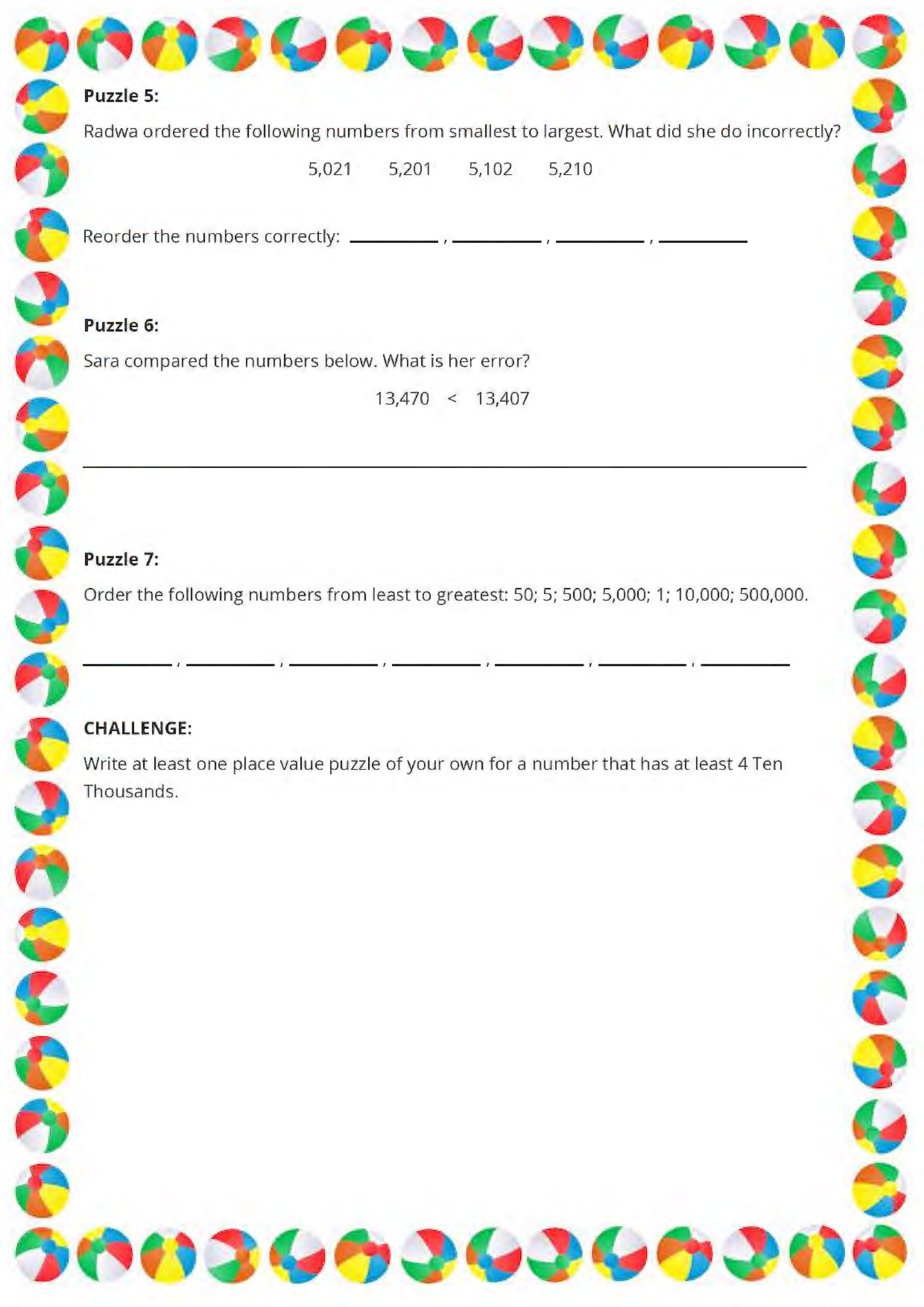
6,000 + 50,000 + 40 + 300 + 2 =

____

Puzzle 4:

Write the following number in expanded form.

3,509 = ____



Puzzle 5:

Radwa ordered the following numbers from smallest to largest. What did she do incorrectly?

5,021 5,201 5,102 5,210

Reorder the numbers correctly: __________ , __________ , __________ , __________

Puzzle 6:

Sara compared the numbers below. What is her error?

13,470 < 13,407

____

Puzzle 7:

Order the following numbers from least to greatest: 50; 5; 500; 5,000; 1; 10,000; 500,000.

__________ , __________ , __________ , __________ , __________ , __________ , __________

CHALLENGE:

Write at least one place value puzzle of your own for a number that has at least 4 Ten Thousands.



Liters & Milliliters

Learn About It

Many aquariums rescue and raise baby animals.

This baby flamingo is drinking food from a dropper. The dropper holds about 10 milliliters of liquid.

This baby sea lion is drinking food from a baby bottle. A bottle used for baby animals can hold about 1 liter of liquid.

Liter (L) and **milliliter (mL)** are metric units of capacity.

Metric Units of Capacity
1 liter = 1,000 milliliters

This water bottle holds 1 liter of water.

This dropper holds 1 milliliter of liquid.

Try this activity to estimate and measure using liters.

Materials: 1-liter container, other containers

STEP 1 Pick 3 containers. Estimate which of the containers holds less than, more than, or about 1 liter.

STEP 2 Use water and the 1-liter container to check your estimates.

STEP 3 Pick one of your containers. Does it hold more, less, or about 1,000 milliliters? Explain how you know.



Guided Practice

Ask Yourself

- Do I need a small unit or a large unit?
- Which is the smaller unit? the larger unit?

Choose the better estimate for the capacity of each.

1. 3 L or 30 mL

2. 1 L or 5 L

3. 14 L or 14 mL

Choose the unit you would use to measure the capacity of each. Write *mL* or *L*.

4. bathtub

5. a spoon

6. a container of milk

Explain Your Thinking ▶ Would you need a larger container to hold 500 mL or to hold 1 L? Explain.

Practice and Problem Solving

Choose the better estimate for the capacity of each.

7. 100 L or 100 mL

8. 20 L or 2 L

9. 200 mL or 200 L

Choose the unit you would use to measure the capacity of each. Write *mL* or *L*.

10. a pail

11. a soup can

12. a drinking glass

13. a pond

14. a small vase

15. a watering can

Solve.

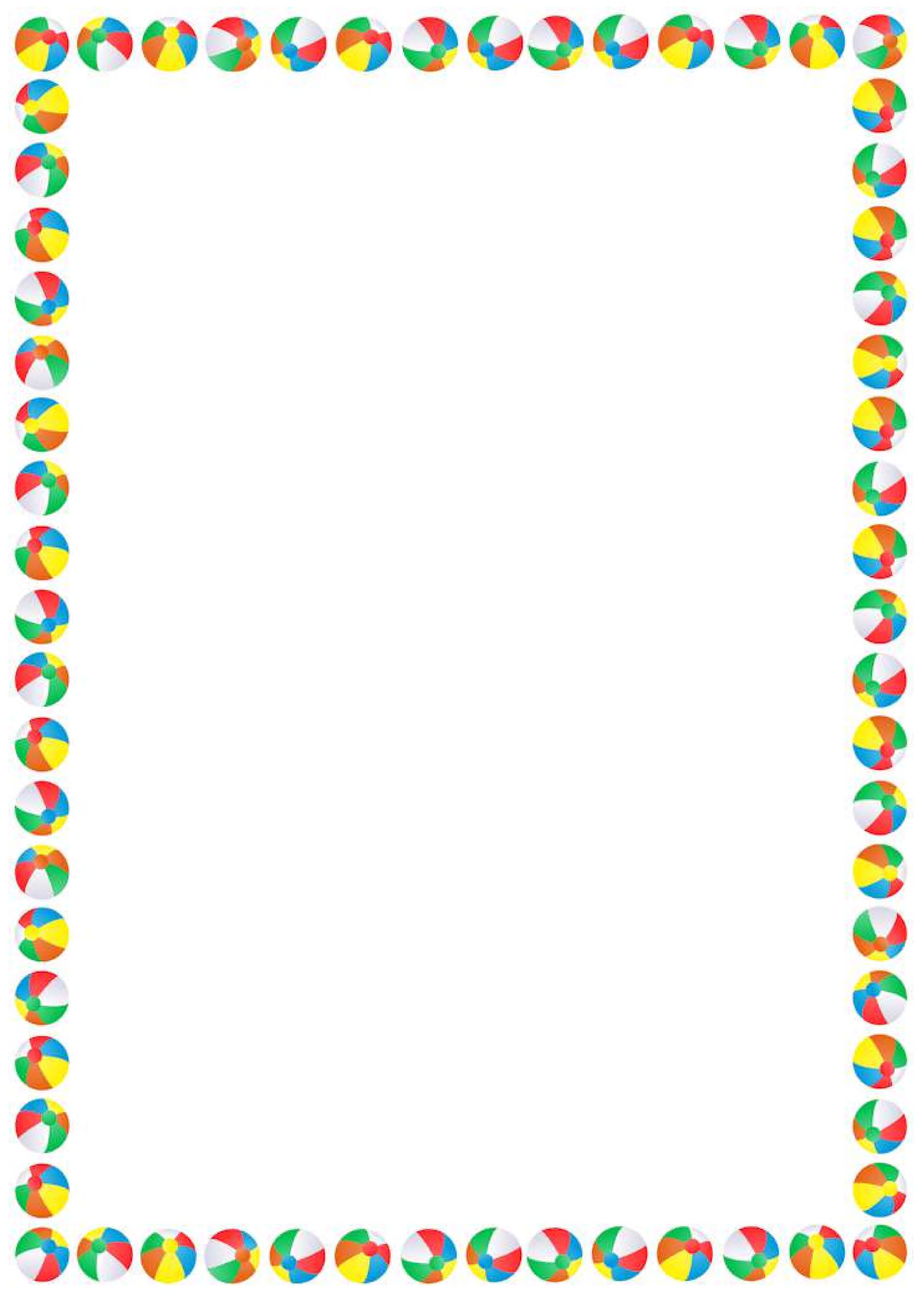
16. Nick poured 2,300 mL of water into a bowl. Then Rea poured 3 L of water into the same bowl. How much water in milliliters is in the bowl now?

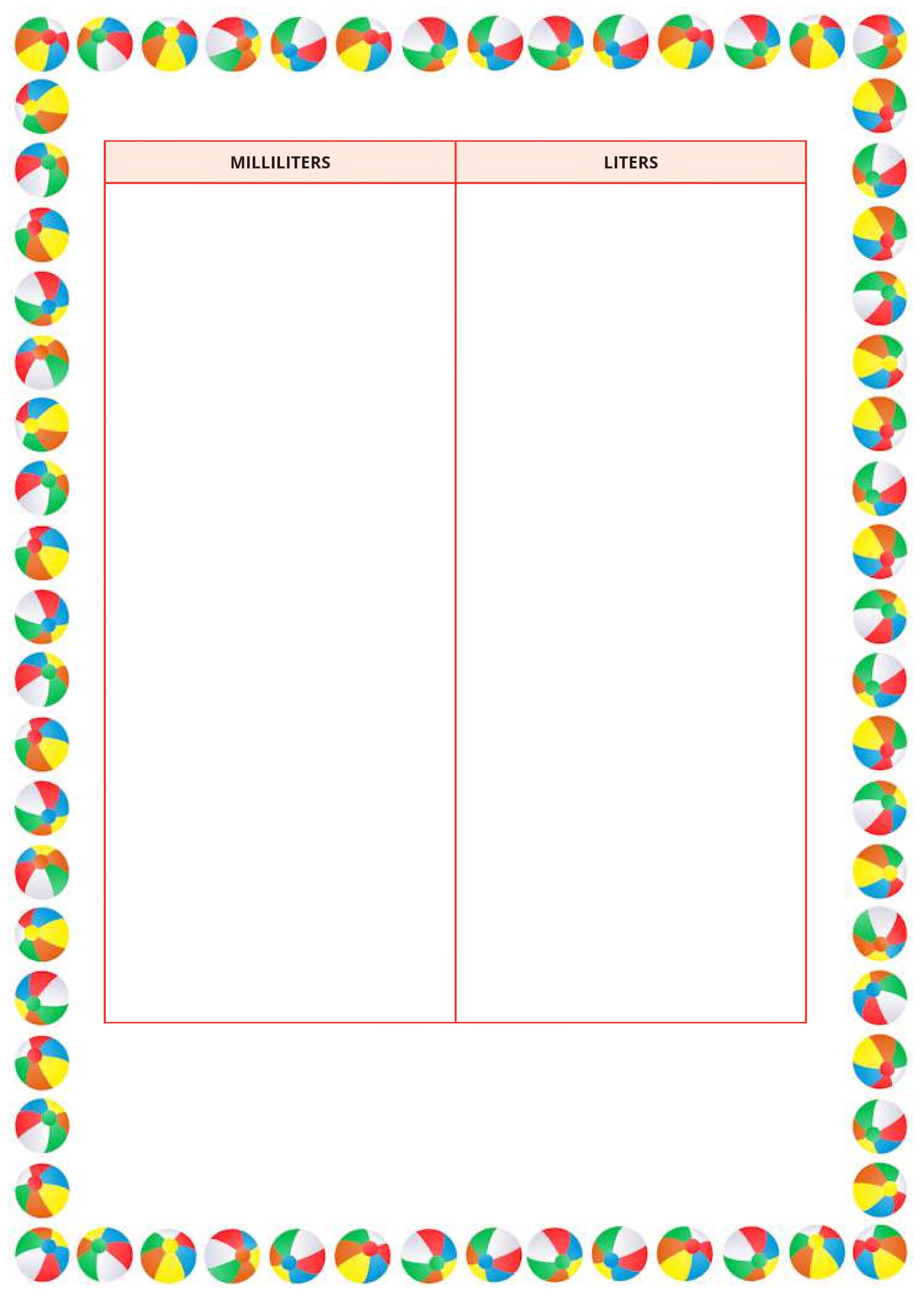
17. **Reasoning** Celia's bottle holds more water than Tim's bottle. One bottle has a red label and holds 2 liters. The other has a blue label and holds 1,500 mL. What color is the label on Tim's bottle?



Directions: Cut out the pictures below and then sort them according to whether the liquid volume is best measured in milliliters or liters. When you and your Shoulder Partner are finished, compare your answers. Discuss any areas of disagreement.

Petrol in a car	Soda in a can	Spoonful of medicine
Dishwashing soap	Water in a bottle	Shampoo in a bottle
Juice in a juice box	Water in the bathtub	





MILLILITERS	LITERS